REPORT ON THE GEOPHYSICAL SURVEY, EXCAVATION AND RE-INSTATEMENT OF A FALLEN STANDING STONE AT LLANFECHELL, ANGLESEY

Project No. G2109
Report No. 932

Prepared for Cadw
March 2011

By George Smith and David Hopewell

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Cover picture:
Llanfechell standing stone after re-instatement, September 2010

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1. INTRODUCTION

A large and well-known standing stone close to the east edge of the village of Llanfechell, North Anglesey was reported to have fallen down on Monday 16th November 2009. The Cadw inspector Dr Mike Yates then arranged for a visit from Gwynedd Archaeological Trust (GAT) to provide an assessment and project design with a view to excavating the disturbed stone-hole and re-erecting the standing stone.

The standing stone at Llanfechell, SAM An 80 PRN 3048 at SH 36999164 was visited in 2002 as part of the Cadw Funerary and Ritual Monument survey and which time it was leaning slightly to the east. It was visited again in 2008 by the Cadw Field Monument warden when it was still standing (Fig. 2a). The stone is a large flat slab, about 2.5m high and 2.1m wide, approximately of even thickness, of about 0.30m. The slab is approximately and rectangular in shape, tapering slightly to the top, which is somewhat rounded.

The stone had fallen to the east and was lying flat on the ground without damage. Its base could then be seen to consist of an asymmetric triangular point of which only 70cm of the stone had been in the ground and supporting it. The basal point had kicked up a part of the pit fill with a packing stone left *in situ* adhering to the stone and lifting some of the natural subsoil from the side of the pit at the same time (Fig. 2b).

2. METHODS

A rapid measured drawing was first made of the fallen stone and this was used to estimate the size of the pit and this was later used to produce a design for a new pit for re-erecting the stone (Fig. 3). A section was also recorded across the portion of the base of the stone that retained part of the pit fill and a packing stone.

The site was then visited with Stuart Brown from *Cadwraeth Cymru* in order to make further arrangements for re-erection of the stone. It was decided that the fallen stone would first have to be moved in order to allow the pit to be excavated. An engineering design was produced for re-erection of the stone, involving excavation of a pit 1.6m x 3m and 1m deep (Fig. 4). The stone would then be lifted into place and the pit filled with hardcore and compacted. This would be mounded up around the base of the stone to stop erosion by trampling cattle.

On 5th January 2010 a small rubber-tracked crane was used to lift the stone to one side and place it on timber blocks supervised by a team from *Cadwraeth Cymru*. The crane recorded the weight lifted, which was 4.6 tons (Fig. 5).

A high resolution geophysical survey was then carried out of an area of 40m square centred on the site of the standing stone pit, as described below.

The area of the stone pit was then excavated by hand on 6th and 7th January 2010, the results described below. A preliminary report was produced on this work (GAT Report No. 860), revised here to include specialist reports, dating and further discussion.

On 6th September 2010 the stone pit was re-excavated and the standing stone lifted back into place using a small crane (Fig. 6). When correctly positioned it was consolidated with a mix of granite chippings and hydrated lime and compacted, the topsoil then placed around and over it (Cover).

Thanks are due to the landowner Prof. Robin Grove-White for reporting the fallen stone and to the farmer Jack Jones, for allowing access for the work. The archaeological work was carried out by George Smith and David Hopewell of GAT. The re-instatement work was arranged and supervised by Stuart Brown of Cadwraeth Cymru and carried out by Aled Ellis, Stone Mason and Building Contractor of Henllan, Denbigh, with the assistance of Gwilym Pritchard of Cadwraeth Cymru.

Prof. Robin Grove-White agreed to donate the cup and ring-marked stone to the Oriel Ynys Mon, and it has been transferred there.

3. TOPOGRAPHIC AND HISTORICAL BACKGROUND

The stone lies in a large field, part of Carrog Farm, belonging to the Bryn-ddu Estate, and is situated on a low ridge at 30m OD within undulating lowland of good agricultural quality. The soils are brown earths over glacial drift over schist with some areas of tuffs and grits, with alluvium in the valley bottoms (Soil Survey and Geological Survey 1:50,000 maps of Anglesey). There are some rock outcrops and evidence of small scale quarrying. The ridge overlooks the village, which surrounds the bridge Pont-y-plas across the Afon Meddannen, which is a tributary of the Afon Wygyr, which enters the sea at Cemaes. Wygyr means ‘The meeting of two rivers’ and Meddannen means ‘the gently flowing river).

The prominent position of the stone gives it a wide view over the valley and to the west in which direction it is intervisible with another monument on top of a slight hill, an unusual setting of three standing stones, which is possibly the remains of a Neolithic chambered tomb, (PRN 3047, SAM An030, Fig. 1). Beyond that hill but not visible from the standing stone is the remains of another possible chambered tomb (PRN 3046) at Cromlech Farm, investigated in 2008 when a scatter of worked chert and a deposit of Beaker pottery was found (GAT Report no. 793). There are cup-marks on the stones exposed at Cromlech Farm and another has been found on a ground-fast rock between the Cromlech farm site and the group of three standing stones (Nash 2005).

Crop marks have also been noted on aerial photographs of Carrog Farm to the north-east of the standing stone (Pixaerial.com). These were investigated by geophysical survey by GAT in 2009 (GAT Report no. 858). 500m east-north-east of the standing stone and along the crest of the same ridge was identified a line of three large round barrows of the Bronze Age. In the valley to the north of these was identified the probable remains of a burnt mound, probably also of the Bronze Age and on the hill summit above a small sub-circular defended enclosure of Early to Middle Iron Age date (mid first millennium BC) but with earlier occupation on the hill also in the Early and Middle Neolithic periods (GAT forthcoming).

The area around Llanfechell therefore has an unusual amount of prehistoric funerary and ritual activity which may indicate a special focus not just a reflection of the general settlement potential of the area. However, it could be that the area as a whole has many more features yet to be discovered. 1.5km to the east-south-east on the small prominent hill of Pen-y-morwydd is another Bronze Age burial mound (PRN 3055) and 1.7km to the north-east a Bronze Age cremation urn has been found (PRN 3050). The area also has a number of settlement features of Iron Age type.

The first record of the Llanfechell stone seems be its presence on the Ordnance Survey 1:2500 map of 1889. It was not mentioned by Skinner, who visited the village, the setting of three standing stones and Cromlech Farm (Skinner 1802). The stone was described by Baynes (1910, 70), with an accompanying photograph, from which it appears that the stone was already leaning. The stone was also noted by the RCAHMW (1937).

4. GEOPHYSICAL SURVEY (Figs 7 and 8)

By David Hopewell

Methodology

Fluxgate gradiometer survey provides a relatively swift and non-invasive method of surveying large areas. The current surveys were designed to assess the effectiveness of gradiometer survey on prehistoric field systems.

Instrumentation

The survey was carried out using a Bartington Grad601-2 dual Fluxgate Gradiometer. This uses a pair of Grad-01-100 sensors. These are high stability fluxgate gradient sensors with a 1.0m separation between the sensing elements, giving a strong response to deeper anomalies.

The instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetised iron oxides which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil therefore contain greater amounts of iron and can therefore be detected with the gradiometer. This is a simplified description as there are other processes and materials which can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Strong readings are also produced by archaeological features such as hearths or kilns because fired clay acquires a permanent thermo-remnant magnetic field upon cooling. This material can also get spread into the soil leading to a more generalised magnetic enhancement around settlement sites.

Not all surveys can produce good results as anomalies can be masked by large magnetic variations in the bedrock or soil or high levels of natural background "noise" (interference consisting of random signals produced by material within the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features. It must therefore be stressed that a lack of detectable anomalies cannot be taken to mean that that there is no extant archaeology.

The Bartington Grad601 is a hand held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 1.0m apart. Their Mumetal cores are driven in and out of magnetic saturation by an alternating current passing through two opposing driver coils. As the cores come out of saturation, the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output.

The gradiometer can detect anomalies down to a depth of approximately one metre. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT, typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The instrument is capable of detecting changes as low as 0.1nT.

Data Collection

The gradiometer includes an on-board data-logger. Readings in the surveys were taken along parallel traverses of one axis of a 20m x 20m grid. The survey was carried out at high resolution, with a traverse interval of 0.5m and a sample interval of 0.25m. This method is used where the priority is producing very accurate high resolution surveys. Guide lines are used in order to ensure very precise data collection. This survey method is more time consuming that standard resolution and is generally used in research surveys where specific smaller archaeological features are being surveyed. It is also useful for surveying very uneven sites or areas containing a lot of obstacles where the guide lines allow accurate survey and allow variable survey rates to be used.

Data presentation

The data was transferred from the data-logger to a computer where it was compiled and processed using ArchaeoSurveyor 2 software. The data is presented as a grey-scale plot (Fig. 7) where data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed. This is supplemented by an interpretation diagram (Fig. 8) showing the main features of the survey with reference numbers linking the anomalies to descriptions in the written report. It should be noted that the interpretation is based on the examination of the shape, scale and intensity of the anomalies and comparison to features found in previous surveys and excavations etc. In some cases the shape of an anomaly is sufficient to allow a definite interpretation e.g. a Roman fort. In other cases all that can be provided is the most likely interpretation. Weak and poorly defined anomalies are susceptible to misinterpretation due to the propensity for the human brain to define shapes and patterns in random background noise. An assessment of the confidence of the interpretation is given in the text. The survey will often detect several overlying phases of archaeological remains and it is not usually possible to distinguish between them.

Data Processing

The data is presented with a minimum of processing although corrections were made to compensate for instrument drift and other data collection inconsistencies. High readings caused by stray pieces of iron, fences, etc are usually modified on the grey scale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. Grey-scale plots are always somewhat pixellated due to the resolution of the survey. This at times makes it difficult to see less obvious anomalies. The readings in the plots are usually smoothed thus producing more but smaller pixels. This reduces the perceived effects of background noise thus making anomalies easier to see. Any further processing is noted in relation to the individual plot.

RESULTS

A square area with dimensions of 40m x 40m was surveyed at high resolution (0.5m x 0.25m). Survey conditions were good with a flat field and short grass. Background noise levels were very low and geophysical anomalies were generally weak. The data was clipped to +-4nT in order to make archaeological anomalies more visible.

Both the stone-hole (1) and the fallen stone (2) produced clear anomalies. This probably indicates that the stone and the packing stones in the hole are weakly magnetic. Two parallel roughly linear anomalies (3) crossing the survey area may be related to the footpath marked on Ordnance Survey maps. The two anomalies are about 3m apart so are too far apart for wheel ruts. The best interpretation would therefore seem to be a double ditched former field boundary. A regular but faint circular anomaly (4) could be a small barrow but is most likely to be a natural subsoil feature. A series of similar but obviously natural sub-circular anomalies can be seen in the southern part of the survey.
The survey is crossed by several poorly defined but roughly parallel anomalies that are probably the result of ploughing. Also visible are a scatter of stronger dipoles that are the result of stray pieces of ferrous material in the topsoil, usually deposited during manuring.

Discussion

The responses in this survey were generally weak but detected several features. Only the stone hole with its packing stones and the fallen stone itself appear to be prehistoric.

5. EXCAVATION RESULTS

The fallen stone was first re-drawn in plan and profile. This showed that the slab had probably been trimmed slightly to shape around its top by smashing the edges (Fig. 9).

The area of the pit needed for the new re-erection pit was excavated by hand revealing the stone pit to be teardrop-shaped in plan (Fig. 10), designed to fit the stone, which had an asymmetric pointed foot, so that the pit needed to be deeper on the north side (Fig. 11). There were no other features cut into the subsoil in the area around the pit but at the east side of the former stone was a thin layer of dark charcoal-rich material (10), compacted into the top of the subsoil (Fig. 10). This was sampled for laboratory study (Sample 105) and included hazel and oak charcoal (Table 1).

The excavation of the stone pit was hampered by incoming ground water. The stone pit had medium sloping sides in cross-profile and was cut into a subsoil of orange-brown glacial till. The pit was filled with a darker soil than would be expected if it was just re-deposited subsoil. However, most of it was taken up with twenty large packing stones, varying from 20-50cm in length, all of which had been disturbed to some extent by the collapse of the stone (Fig. 12). A small amount of fill was still *in situ* against the east side of the pit where it had not been kicked out by the foot of the stone. Two pieces of charcoal (Samples 103 and 104), one of which was of hazel (Table 1) were collected from this area and 10L of soil was collected for flotation for possible other carbonised macrobotanical remains.

The pit had a base that slope down from south to north and had been designed to fit the shape of the base of the standing stone. At the lowest part of the pit, where the pointed toe of the stone had been a small horizontal slab was found still *in situ* that was clearly a pad stone under the toe of the standing stone (Fig. 11). Removal of this slab revealed a small steep-side pit [6] 0.30m dia. and 0.12m deep. Its fill was dark and stone-free, with no visible inclusions. Because of rising ground water all the fill of the pit was taken out and retained for study in the laboratory (Sample 102).

After backfilling the pit with soil and replacing the turfs, the packing stones were placed on top of the pit ready to be moved before excavation of the new pit.

Difficulties in organising the re-excavation and re-erection meant that the site would have to be left for 3 months so the site of the excavation was re-visited to check on its condition. It was then seen that one of the three largest packing stones had a cup and ring-mark carving and another single cup mark on one of its faces (Figs 13 and 14). The cup-marks were fairly deep and steep-sided compared to most known examples. The ring mark in contrast was shallow and rather inaccurately executed with individual peck marks visible. The carvings were on a flat face of a sub-rectangular slab *c*. 0.5m square and 0.15m thick and were not set centrally on the slab. The reverse side of the slab was green with algae, showing that this face had been exposed on the surface, perhaps standing in a pool of water after collapse of the stone. All the packing stones were then cleaned and inspected carefully, then photographed and drawn but no other marks were found. Most of the stones were thick flat slabs of a similar rock and thickness to that of the standing stone. It seemed a possibility that these were the remains of a larger slab that had been broken up. However, this was not so because careful study showed that their edges, although angular, were weathered and so not recently broken prior to burial. A few of the rocks were glacial erratics of other rock types.

6. ENVIRONMENTAL ANALYSIS: THE CHARRED PLANT REMAINS AND CHARCOAL FROM LLANFECHELL STANDING STONE, by Astrid E. Caseldine, Inga A. Peck and Catherine J. Griffiths

Samples were taken during the excavations at Llanfechell with the aim of recovering material for radiocarbon dating and to obtain environmental evidence.

The provenance of the samples was as follows:
Sample 101 – from fill of undisturbed part of standing stone pit
Sample 102 – fill of small pit at base of standing stone pit and sealed by horizontal stone slab
Sample 103 – charcoal from fill of undisturbed part of standing stone pit
Sample 104 - charcoal from fill of undisturbed part of standing stone pit
Sample105 – from a small spread of possible burnt material at bottom of topsoil

Plant macrofossils

Methods
The bulk samples were processed using standard flotation procedures. The finest sieve mesh used to recover the plant remains was 250 µm. The samples were sorted using a Wild M5 microscope.

Results
The samples failed to produce any charred remains apart from wood charcoal. These are summarised in Table 1.

Charcoal

Methods

Samples were fractured to produce three sections (transverse, transverse longitudinal and radial longitudinal). A Leica DMR microscope with incident light source was used to identify the charcoal. Identification was by reference to Schweingruber (1978) and Schoch *et al* 2004.

Results and discussion

Sample 104, one of the samples from the fill of the standing stone pit, failed to produce any charcoal that was large enough to be identified. The charcoal from the other samples was poorly preserved and much of it distorted. A small amount of charcoal was, however, identified from the other samples and samples from this were sent for AMS dating. Sample 102 from the fill of a small pit at the base of the standing stone pit produced only a few fragments of Ericaceae type charcoal. These gave a date of 740 to 390 Cal BC. Apart from sample 104, two other samples, 101 and 103, from the standing stone pit did yield some identifiable charcoal. Hazel (*Corylus avellana*) was identified from sample 103 and sent for dating but unfortunately proved to be insufficient. Ericaceae, hazel and oak (*Quercus* sp.) charcoal fragments were identified from sample 101 and one of the hazel fragments gave a date of 4460 to 4330 Cal BC.

The evidence suggests the growth of hazel and oak woodland in the area prior to the placement of the standing stone. The presence of Ericaceae charcoal dated to the Iron Age suggests the presence of heathland in the area by that time. The occurrence of Ericaceae charcoal in the sample dated to the late Mesolithic may indicate heathland in the area at that time or it is possible that it is later contamination, given the date on the Ericaceae charcoal from sample 102.

Table 1 Charcoal identifications from Llanfechell standing stone

Sample	**101**	**102**	**103**	**105**
Context	Fill of stone pit	Fill of 'foundation' pit	Fill of stone pit	From burnt area on north edge of pit
Taxa				
Quercus spp. (Oak)	2	-	-	1
Corylus avellana L. (Hazel)	2*	-	2*	2
Ericaceae (Heathers)	9	3*	-	-
Indet.	14	-	-	-

* includes sample used for AMS dating

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7. RESIDUE ANALYSIS

Two micro-samples from the cup-marked stone were taken for trial analysis for residues to test the hypothesis that cup marks may have had libations of organic substances or pigment or of oils for use as simple wick lamps. The samples were taken from inside the cup mark and from a blank area of the stone. These were analysed by Ben Stern at the University of Bradford as part of research into the presence of organic materials in stone objects. The samples produced no evidence of any lipid residues, well verified by the close match with the result from the control sample from the blank area of stone, see Appendix 1.

8. RADIOCARBON DATING

Two samples were initially submitted to the SUERC laboratory, Glasgow. One was from the fill of the 'foundation' pit [6] identified as ericaceae, probably heather, Sample <102A> (Caseldine above). The other was from flotation of a bulk soil sample from the fill of the contents of the stone pit, Sample <101>, identified as corylus (hazel).

Sample <102A> produced a date with a main range of 550 to 390 cal BC at 95% probability (SUERC-28587).

Sample <101> failed due to insufficient carbon. Although of sufficient weight the sample proved to be of only partially carbonised material and so dissolved during pre-treatment. Another, replacement sample <103> was provided, a hand-picked piece from the fill of the contents of the stone pit, also identified as of corylus. However, this also dissolved on pre-treatment.

A further sample <101>, also of corylus (hazel) was later retrieved from the fill of the stone pit and submitted to Beta Laboratories, Florida. This returned a date of 4460 to 4330 cal BC at 95% probability.

The full results are shown in Appendix 2.

9. INTERPRETATION

The small pit under the toe of the standing stone had a covering slab and so was clearly a deliberate foundation deposit and not an earlier post-hole as, for instance, had been interpreted for a small pit beneath the standing stone at Cremlyn South, Anglesey (Lynch 1980). The dark fill of the probable foundation pit did not contain any obvious artefacts or inclusions such as charcoal or cremated bone but was certainly organic-rich. The laboratory analysis identified only charcoal of ericaceae, probably heather, which was unusual (Table 1). There was no evidence of a cremation.

The presence of the foundation pit provided good confirmation that the standing stone was indeed a prehistoric feature and not a post-medieval folly or cattle rubbing stone. The foundation pit must signify the actual moment of erecting the stone and so a radiocarbon date from it should be significant for knowledge about standing stones generally. However, the date produced from the heather charcoal was in the Early to Middle Iron Age, which is at odds with a number of previous excavations at or near standing stones, which have produced artefacts or dates of the Early Bronze Age (Williams 1988).

Standing stones on Anglesey and Llŷn are quite numerous. They occupy generally slightly elevated locations but not dramatic view points and are scattered relatively evenly and widely within Anglesey, compared to the more grouped occurrence of Neolithic chambered tombs, for instance. They sometimes have associated features of Early Bronze Age date but which could have been added much later. Primary dating material is rare so the actual date and function of standing stones is uncertain. One standing stone, small and squat so not typical, was found beneath an Early Bronze Age burial mound at Bedd Branwen, Anglesey and a date for this stone was surprisingly within the Early Neolithic period (Lynch 1991, 348). The pit of another fallen standing stone at Cremlyn, Anglesey, has also been excavated (Lynch 1980) *ibid*) but this did not produce any clear dating evidence apart from a flint scraper of probable Bronze Age, found close by. Excavations close to another standing stone in the 19th century at Glynllifon, Caernarfon uncovered a cremation burial with urn of Early Bronze Age date (Williams Wynn 1875). There were no artefacts from the excavation of the Llanfechell stone.

The charcoal from the fill of the stone pit was of oak, hazel and ericaceae, probably heather. This should provide evidence that environment prior to the erection of the standing stone was oak and hazel woodland with some heathland but the date from one of the pieces of hazel was in the later Mesolithic period and so presumably this and some or all of the other pieces are residual. The presence of ericaceae is also unusual and the fact that charcoal of the same taxa was also recovered from the foundation pit, which produced an Iron Age date, makes both dates of uncertain validity and interpretation.

The presence of the cup and ring-marked stone in the stone pit provides added interest. It is rare, perhaps unique in being found in a stratified deposit. Such marks are usually found on exposed ground rocks but occasionally on the stones of earlier monuments and therefore at least contemporary or later than them. Some Neolithic chambered tombs have cup-marks, for instance at Ty Newydd, Anglesey and Bach Wen, Clynnog Fawr, Gwynedd. Other cup-marks are found on the stones belonging to Early Bronze Age burial cairns, for instance at Llecheiddior ring cairn, Llanbedr, Meirionnydd (PRN 1089) and at Bron-lletty-ifan kerb cairn, Arthog, Meirionnydd (PRN 12895). Such marks are sometimes single or if multiple in random distribution. At the Bron-letty-ifan site, however, they formed an arc that must be deliberate and so could be classed as art. Many examples of cup and ring marks, sometimes associated with more complicated patterns occur on exposed ground rocks in North Yorkshire, Cumbria and Scotland but are much rarer in Wales. The only such mark with an associated datable feature is that on the capstone of a probable Neolithic chambered tomb at Garn Turne, Pembrokeshire (Nash 2005, 15-16), suggesting an association with the more frequent simple cup-marks found in similar locations. The cup and ring mark here is of rather crude style, as if created rapidly and without great care (Fig. 13). The central cup mark is quite neat and deep. The ring, however, is very shallow, as if incomplete, one part has a neat curve, but the remainder is completed by two almost straight lines of pecking, which may be deliberate or be an unskilled attempt at a completing the ring. The peck marks are heavy and distinct. Experiment has been able to produce a similar design a rock with an angular point (D. Chapman, pers. Com.). The cup and ring mark overall is crude compared to other such marks elsewhere or to the neat designs and spiral motifs on Neolithic monuments, such as those at Barclodiad y Gawres, Anglesey, produced by pecking followed by grinding. There is also another cup-mark on the Llanfechell stone, which is small, oval and deep, rather than shallow, rounded and cup-shaped as is the case with most cup-marks. It is in fact two closely conjoined cup-marks. The cup and ring mark is also not centrally located on the slab, although clearly a smooth flat natural face has been chosen. It is possible that the mark was originally on a larger stone that it has been broken off from, or at least reduced in size from. Two edges of the slab are jagged and irregular, possibly deliberate fractures (Figs 13 and 14).

In general, cup marks and cup and ring marks are most frequently found on large natural exposures of stone and these must have been regarded as of similar import to the Neolithic tombs that were also marked. Their primary purpose must have simply been to make a lasting mark, whatever that meant in terms of religious beliefs. The outcrops on which they are found are in prominent positions, often major viewpoints over passages through valleys. Their open and often upland positions have suggested an association with itinerant populations of hunters or herders (Beckensall 2002). More rarely they are found on monuments such as standing stones or burial cairns, sometimes on the slabs of burial cists. The placing of the cup and ring-marked stone in the standing stone pit could have been part of the original construction or it could have been inserted at a later date. Whichever, the stone is little different to the other packing stones, and may have been no more than a special packing stone, so seems to have been hidden from view, which is unusual since most other cup-marks and cup and ring-marks are openly displayed. In that case in the case of the buried item it had meaning only for the individual that placed it there and so was not a lasting public memorial or landscape marker. The general design of cup and ring-marks have been compared to that of chambered tombs and henges, with possible symbolic meaning, for instance of birth and re-birth (Bradley 1997), and that seems more understandable when found in conjunction with some kind of memorial or burial.

The function of standing stones is still uncertain although they sometimes have close links with burial mounds and other funerary and ritual activity. However, it is accepted that they a quite different type of feature to the wide variety of burial mounds and are not primarily funerary monuments. Some of the most productive investigations of standing stones show that they were sometimes preceded by timber posts, were sometimes succeeded by burial mounds and were sometimes associated with more complicated structures of a monumental nature (Williams 1986 and 1988). The excavation and geophysical survey here did not identify any such complexity but geophysical surveys are not always effective, depending on the subsoil type and the excavation was of very limited extent. The position of the stone, on the same ridge as a line of burial mounds suggests an association between them and that would fit in with results from the various standing stones that have been excavated, indicating an Early Bronze Age date. Most standing stones are situated in lowland and often in apparent isolation, differing from the distribution of burial mounds, of which many lie at higher altitudes or at least on summits and often in groups. The distribution and type of location of standing stones has given rise to suggestions that they functioned as territory markers, perhaps as focuses rather than boundaries (Evans 1927; Williams 1986, 12). Some standing stones are indisputably associated with ancient track ways of which there are number in Meirionnydd (Bowen and Gresham 1967). Cup marks could have performed a similar function as markers of territory or places of significance, if only in terms of mental maps of the land.

As described above it is possible that the cup and ring-mark was originally made on a larger slab in a different location and we know that cup marks were sometimes placed on the slabs of Neolithic tombs. It is also possible that the standing stone itself, being a very impressive flat slab, was not freshly quarried but more easily obtained by removing it from another monument nearby, such as the capstone of a chambered tomb. The possible chambered tomb at Cromlech Farm, for instance was reported as having been dismantled to make walls (Skinner 1802, 41) and it has been suggested that the closely set group of three standing stones on the next hill summit to the west of the standing stone were the supports for the capstone of a chambered tomb (Baynes 1910, 65-6). They seem too thin to have supported a heavy slab and the Llanfechell standing stone is not quite large enough to have straddled them. There is also a large slab in the south-east corner of Llanfechell church that has been suggested to have been part of a cromlech (Baynes 1910, 51).

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APPENDIX 1

RESIDUE ANALYSIS OF THE CUP AND RING MARKED STONE

ANALYSIS OF ORGANIC RESIDUES FROM STONE SAMPLE BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY, by Ben Stern, Archaeological Sciences, University of Bradford

Sample preparation

Two of the samples GAT107 (labelled a and b in this report) and the control sample were solvent extracted with ~2 ml DCM:MeOH (dichloromethane:methanol 2:1, v/v). The solvent extract was transferred to another vial and removed under a stream of nitrogen to leave the lipid extract. Excess BSTFA (*N,O*-bis(trimethylsilyl)trifluoroacetamide) with 1% TMCS (trimethylchlorosilane) was added to derivatise the sample. Excess derivatising agent was removed under a stream of nitrogen. The samples were diluted in approximately 0.1 ml of DCM for analysis by GC-MS. A method blank was prepared and analysed alongside the samples.

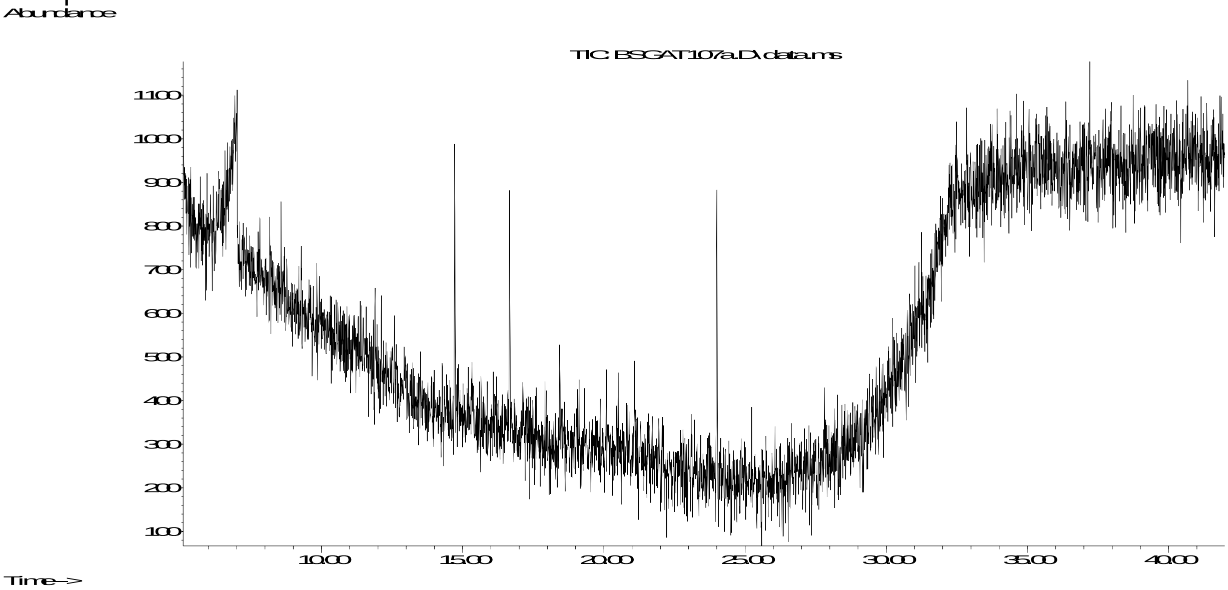
Instrumental (GC-MS)

Analysis was carried out by combined gas chromatography-mass spectrometry (GC-MS) using an Agilent 7890A Series GC connected to an 5975C Inert XL mass selective detector. The splitless injector and interface were maintained at 300°C and 340°C respectively. Helium was the carrier gas at constant inlet pressure. The temperature of the oven was programmed from 50°C (2 min) to 350°C (10 min) at 10°C/min. The GC was fitted with a 15m X 0.25mm, 0.25   m HP-5MS 5% Phenyl Methyl Siloxane phase fused silica column. The column was directly inserted into the ion source where electron impact (EI) spectra were obtained at 70 eV with full scan from *m/z* 50 to 800.

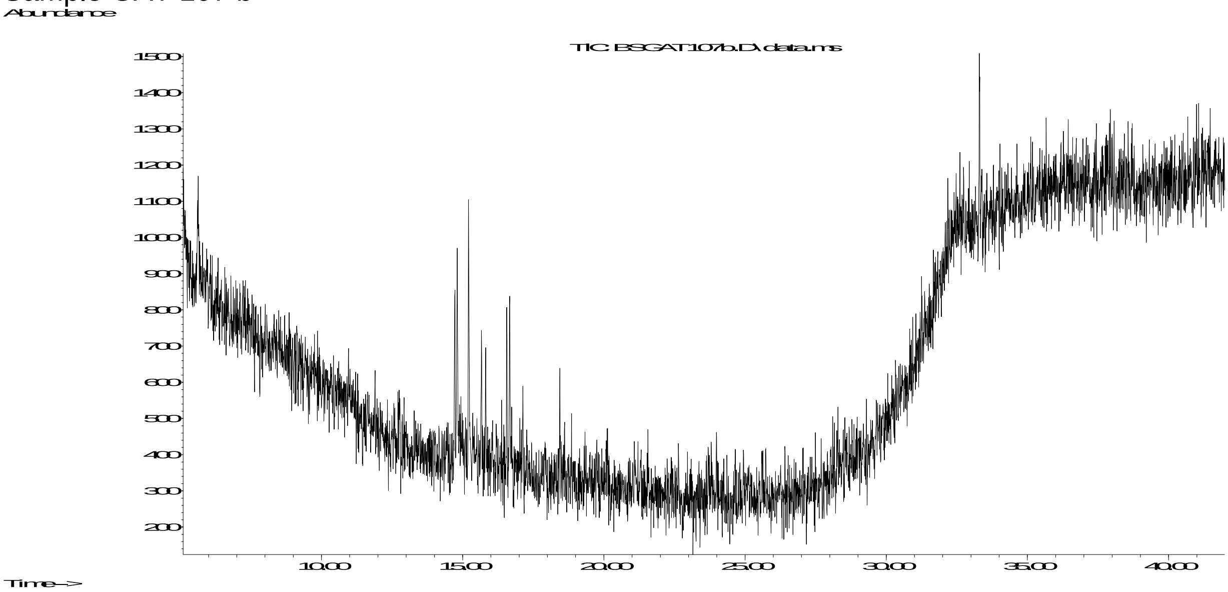
Results (GC-MS)

The results are presented as total ion chromatograms of the BSTFA derivatized solvent extract (-$Si(CH_3)_3$ derivatives). These show each separated component of the solvent extract as discrete peaks, the area under each peak being representative of the abundance.

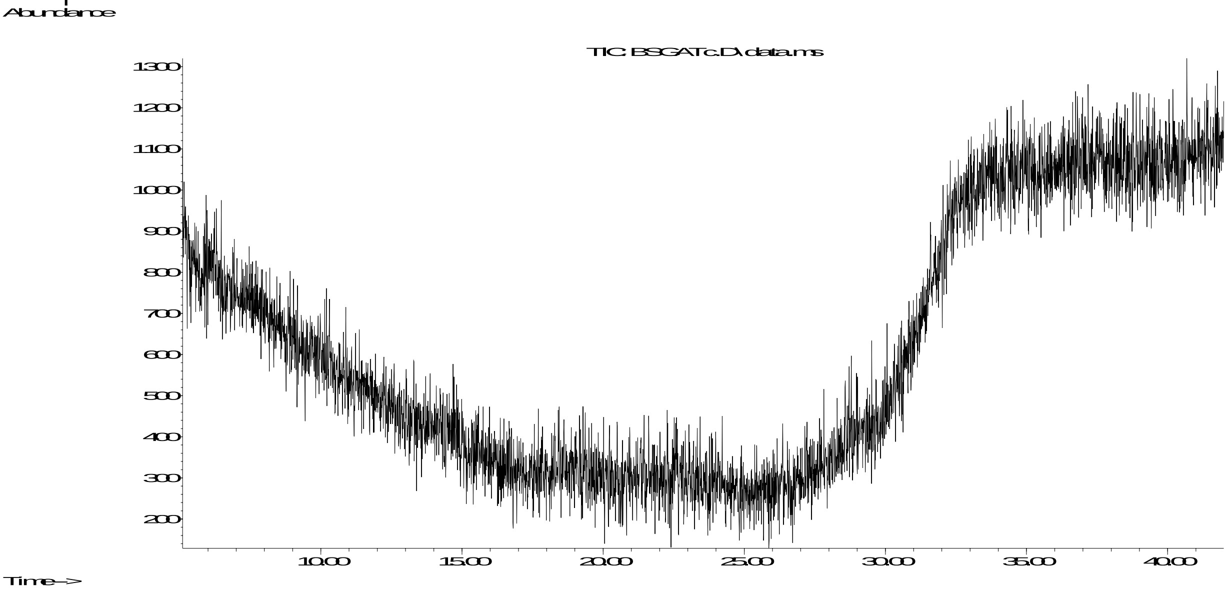
Sample GAT 107 a



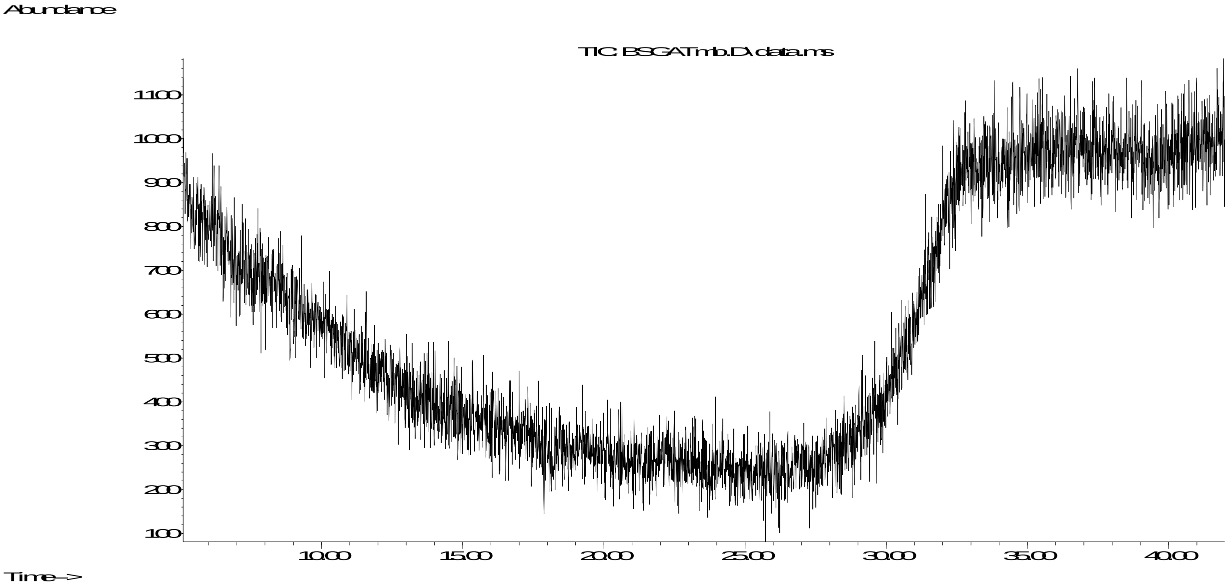
Sample GAT 107 b



Sample GAT control



Method blank



Interpretation

No lipids were found in these samples.

APPENDIX 2

RADIOCARBON DATING

Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

8 April 2010

Laboratory Code	SUERC-28587 (GU-21143)
Submitter	George Smith Gwynedd Archaeological Trust Graig Beuno, Ffordd y Garth Bangor Gwynedd LL57 2RT
Site Reference	Llanfechell An 80
Sample Reference	G2109-102A
Material	Charcoal : Ericaceae
$\delta^{13}C$ relative to VPDB	-28.3 ‰
Radiocarbon Age BP	2410 ± 30

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

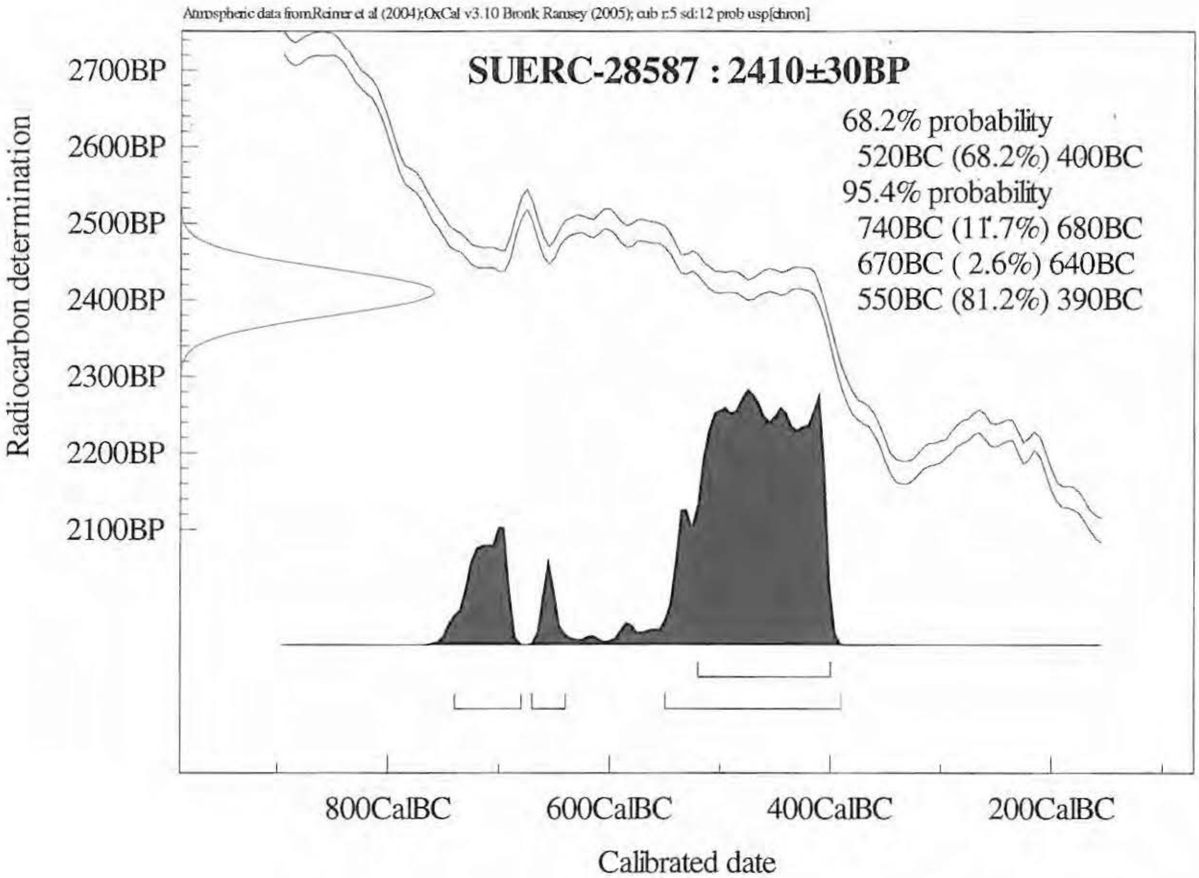
2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).

3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Gordon Cook Date :- 8-4-10

Checked and signed off by :- P Naysmith Date :- 8-4-10

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

8 April 2010

Laboratory Code	GU-21144
Submitter	George Smith Gwynedd Archaeological Trust Graig Beuno, Ffordd y Garth Bangor Gwynedd LL57 2RT
Site Reference	Llanfechell An 80
Sample Reference	G2109-103
Material	Charcoal : Ericaceae
$\delta^{13}C$ relative to VPDB	‰
Radiocarbon Age BP	Sample failed insufficient carbon.

N.B. 1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Gordon Cook Date :- 8-4-10

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

October 27, 2010

Mr. George Smith
Gwynedd Archaeological Trust
Craig Beuno, Ffordd y Garth
Bangor
Gwynedd, North Wales LL57 2RT
United Kingdom

RE: Radiocarbon Dating Result For Sample G2109101

Dear George:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analysis. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

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

REPORT OF RADIOCARBON DATING ANALYSES

Mr. George Smith Report Date: 10/27/2010

Gwynedd Archaeological Trust Material Received: 10/19/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 286714	5550 +/- 40 BP	-25.5 o/oo	5540 +/- 40 BP

SAMPLE : G2109101
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal BC 4460 to 4330 (Cal BP 6400 to 6280)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.5:lab. mult=1)

Laboratory number: **Beta-286714**

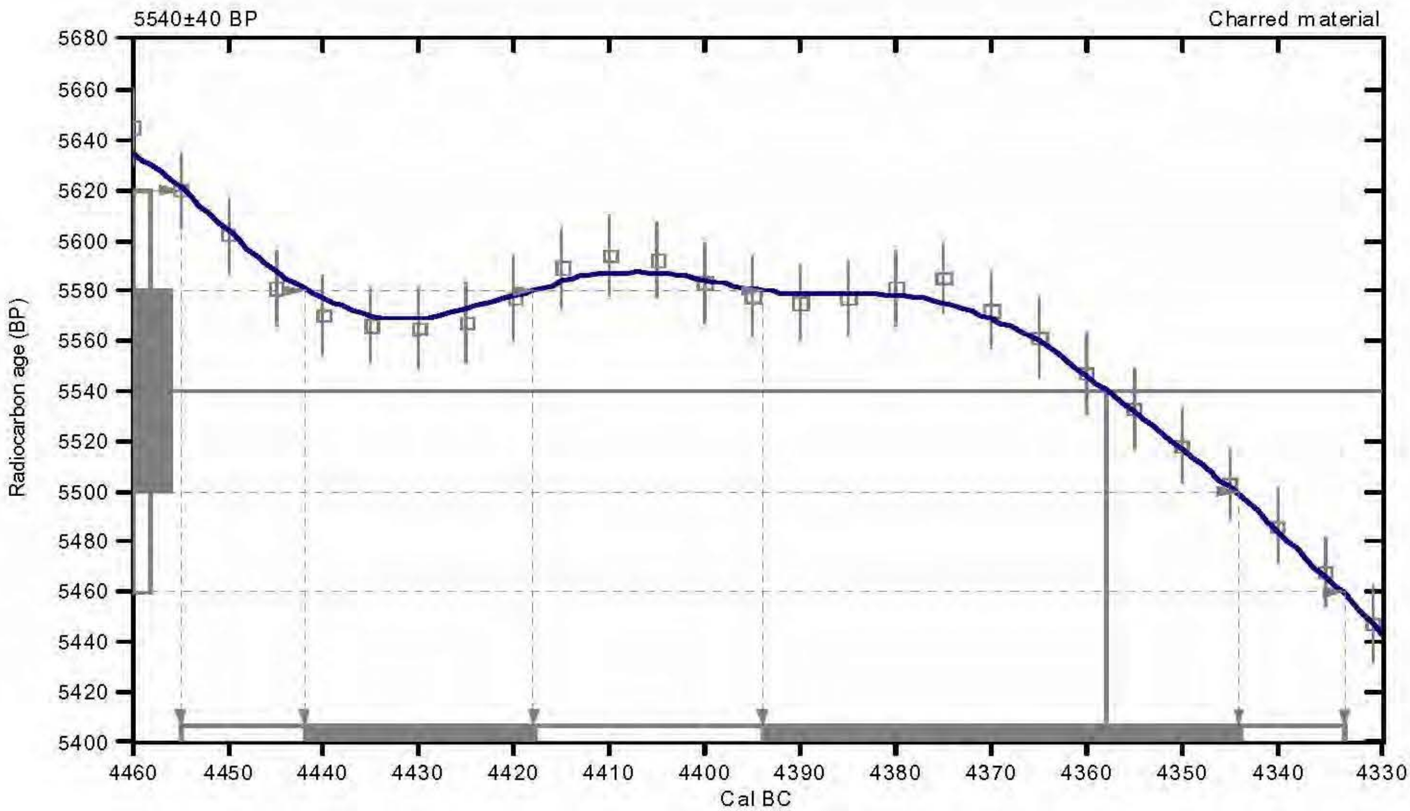
Conventional radiocarbon age: **5540±40 BP**

2 Sigma calibrated result: **Cal BC 4460 to 4330 (Cal BP 6400 to 6280)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 4360 (Cal BP 6310)

1 Sigma calibrated results: Cal BC 4440 to 4420 (Cal BP 6390 to 6370) and
(68% probability) Cal BC 4390 to 4340 (Cal BP 6340 to 6290)



References:

Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
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Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

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

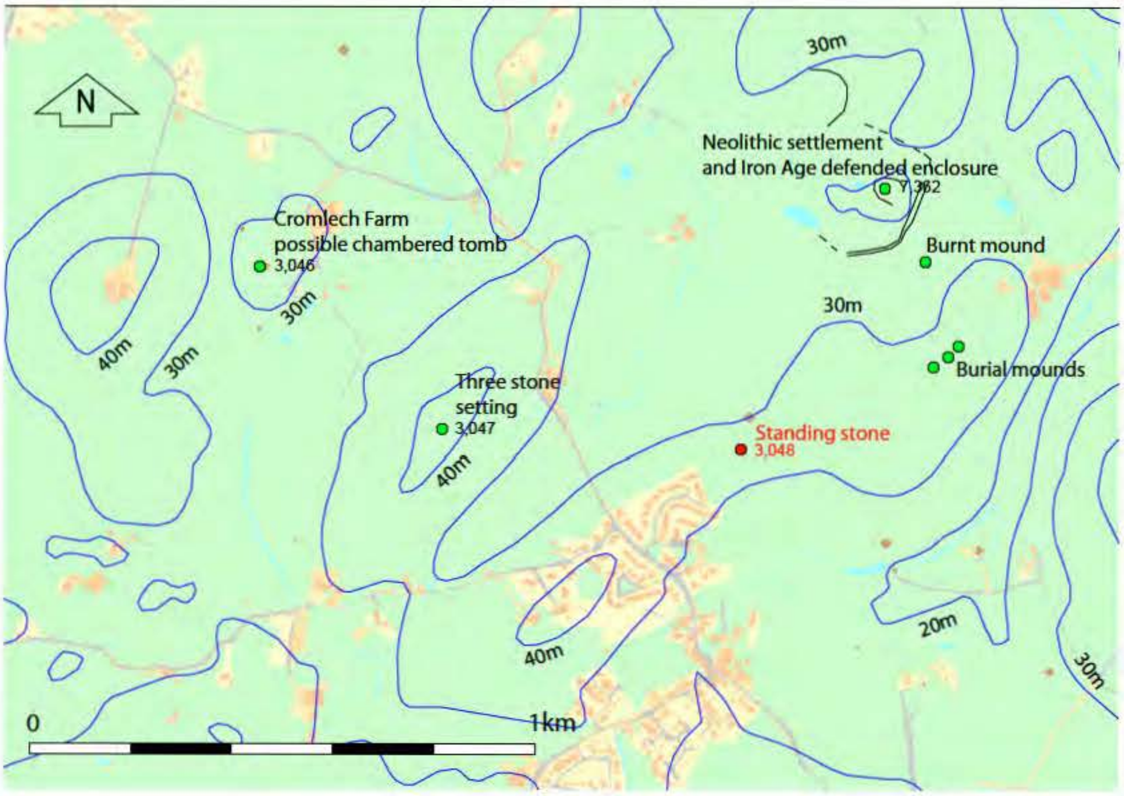

Fig. 1 Llanfechell standing stone. Location map

Fig. 2a Llanfechell standing stone SAM An 80 in 2008, from the north.
2m scales

Fig. 2b Llanfechell standing stone after collapse 2009. Detail of toe of stone
and uplifted pit fill, from the north. 1m scale

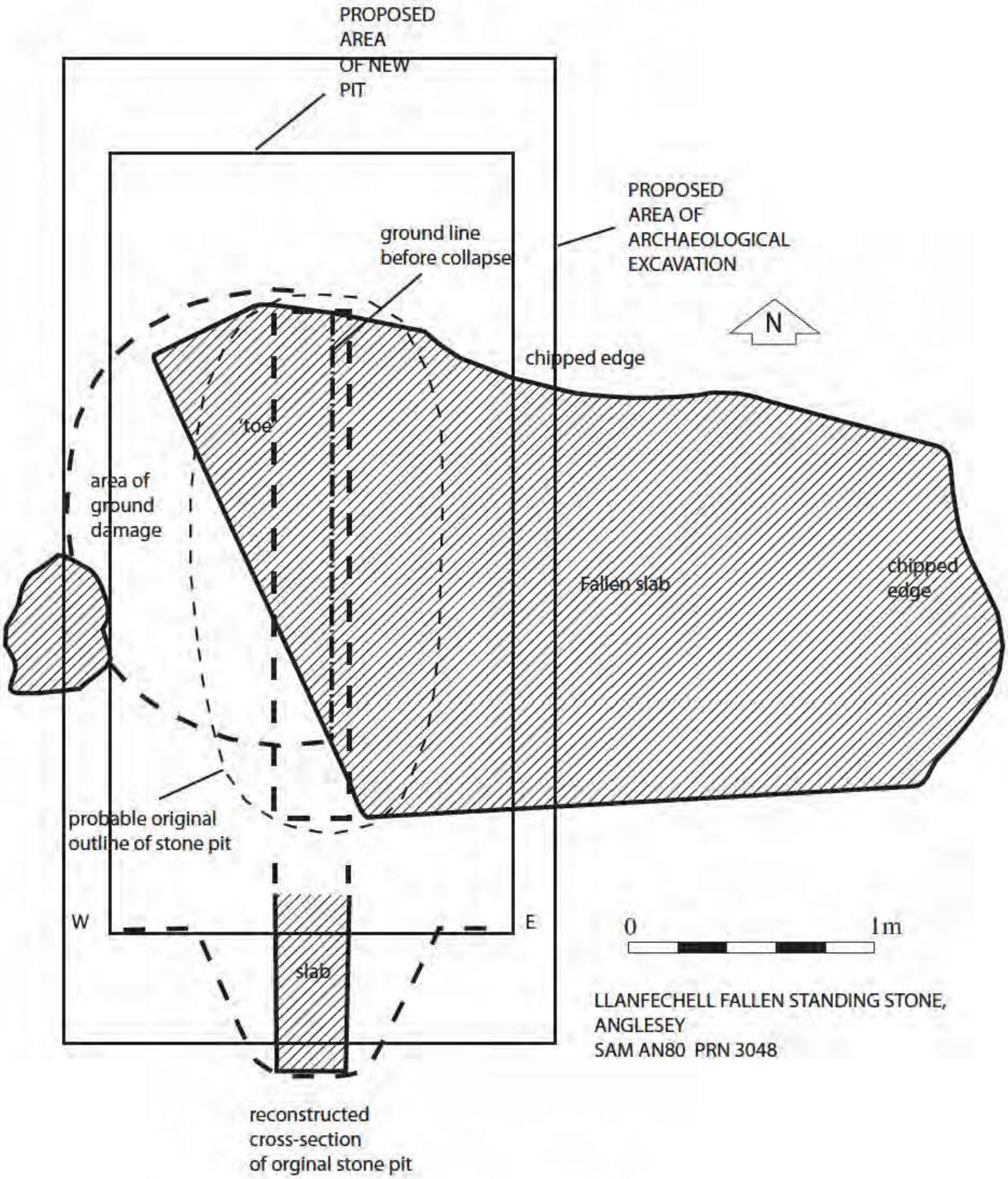

Fig. 3 Llanfechell fallen standing stone SAM An 80, rapid measured drawing and estimate of stone pit depth

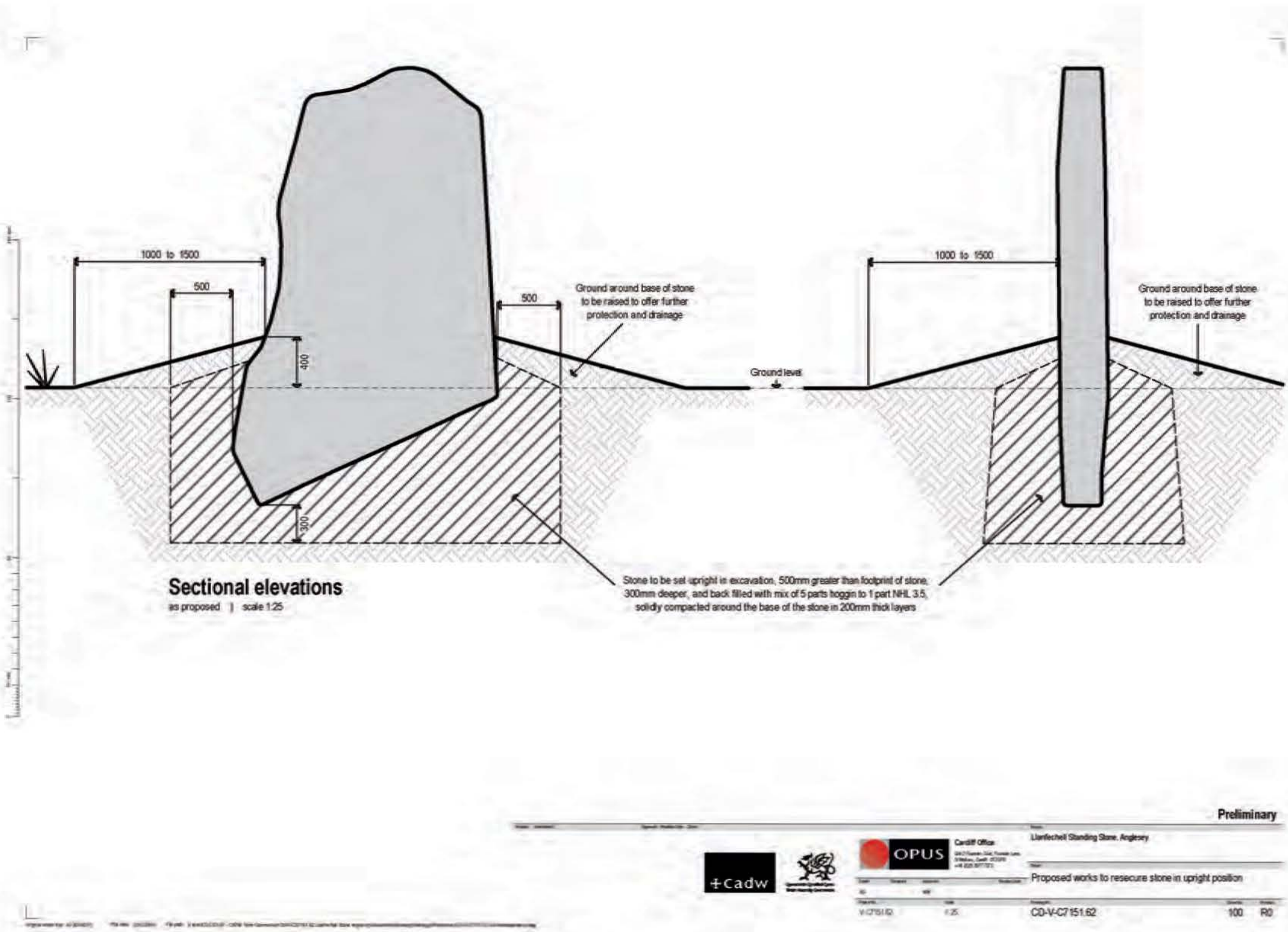

Fig. 4 Cadwraeth Cymru design for re-instatement of fallen standing stone

Fig. 5 Llanfechell standing stone. Lifting the fallen stone clear of the pit, Jan. 2010

Fig. 6 Llanfechell standing stone. Lifting the stone back into position, Sept. 2010

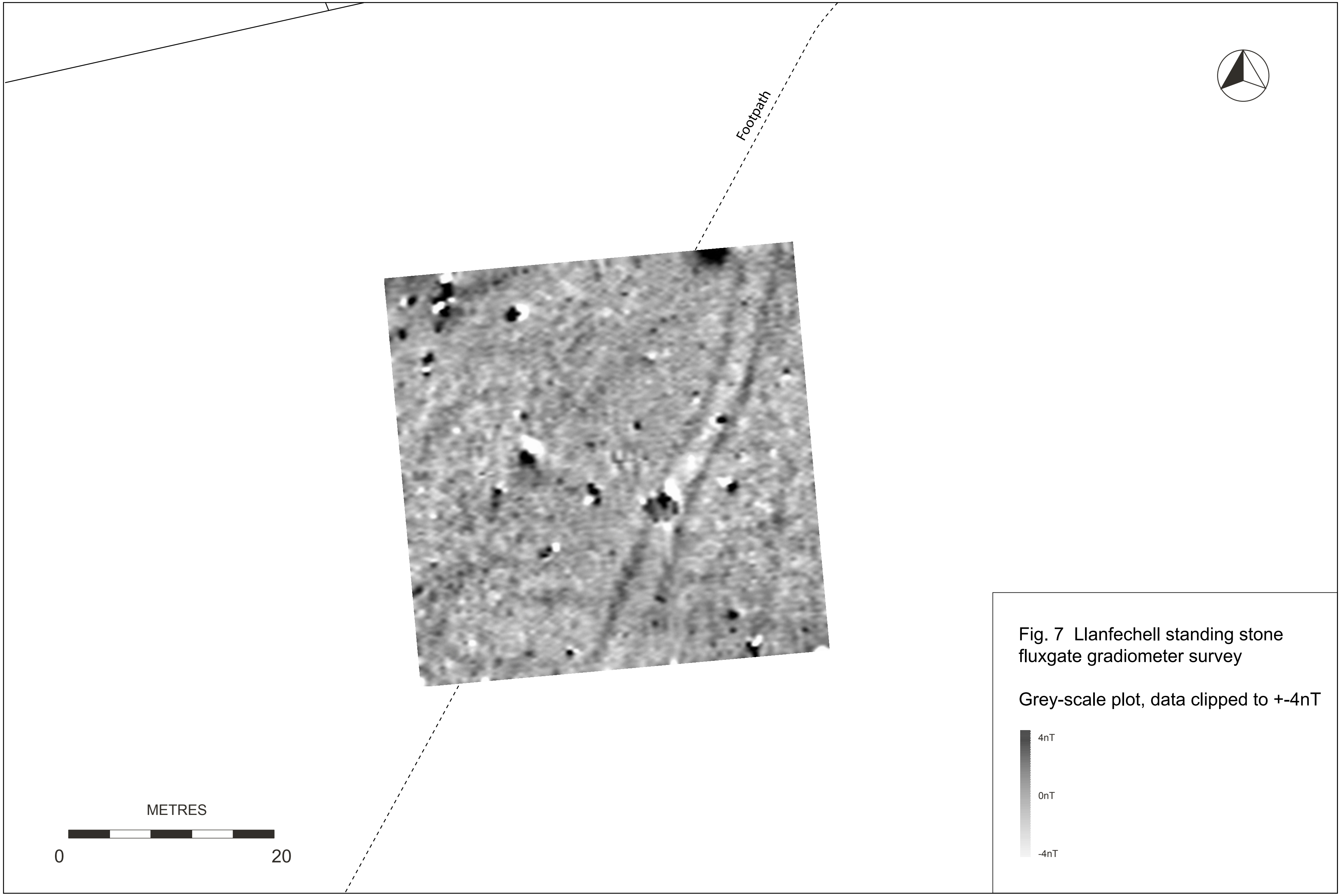

Fig. 7 Llanfechell standing stone fluxgate gradiometer survey

Grey-scale plot, data clipped to +-4nT

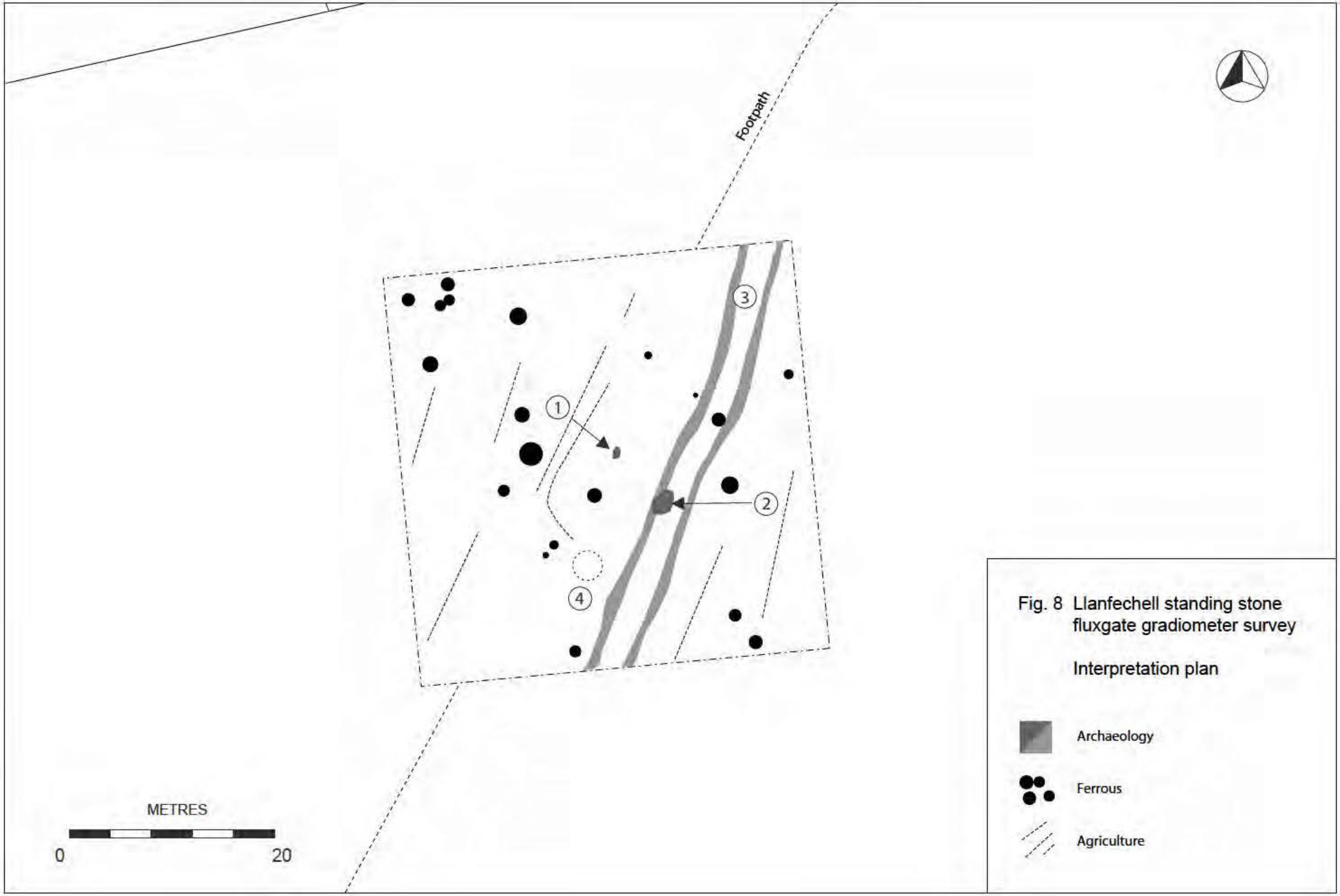

Fig. 8 Llanfechell standing stone fluxgate gradiometer survey

Interpretation plan

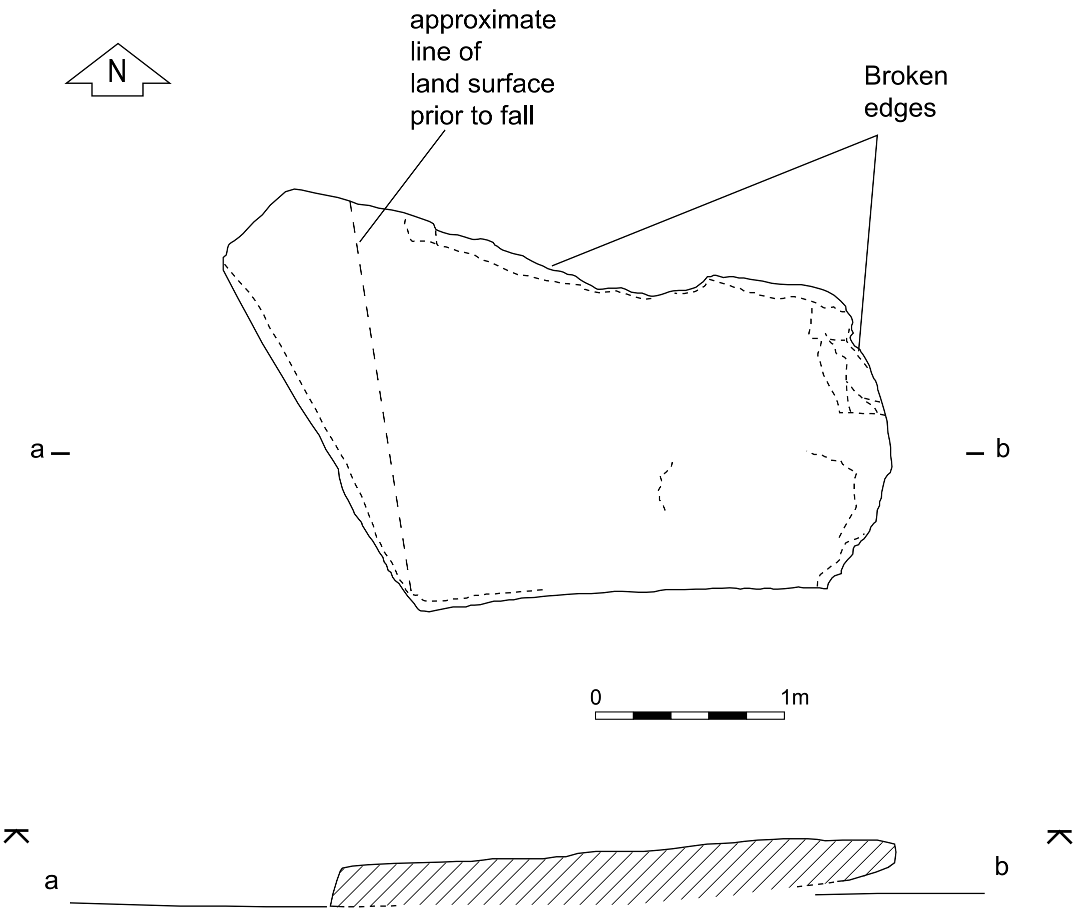

Fig. 9 Llanfechell fallen standing stone. Plan and profile

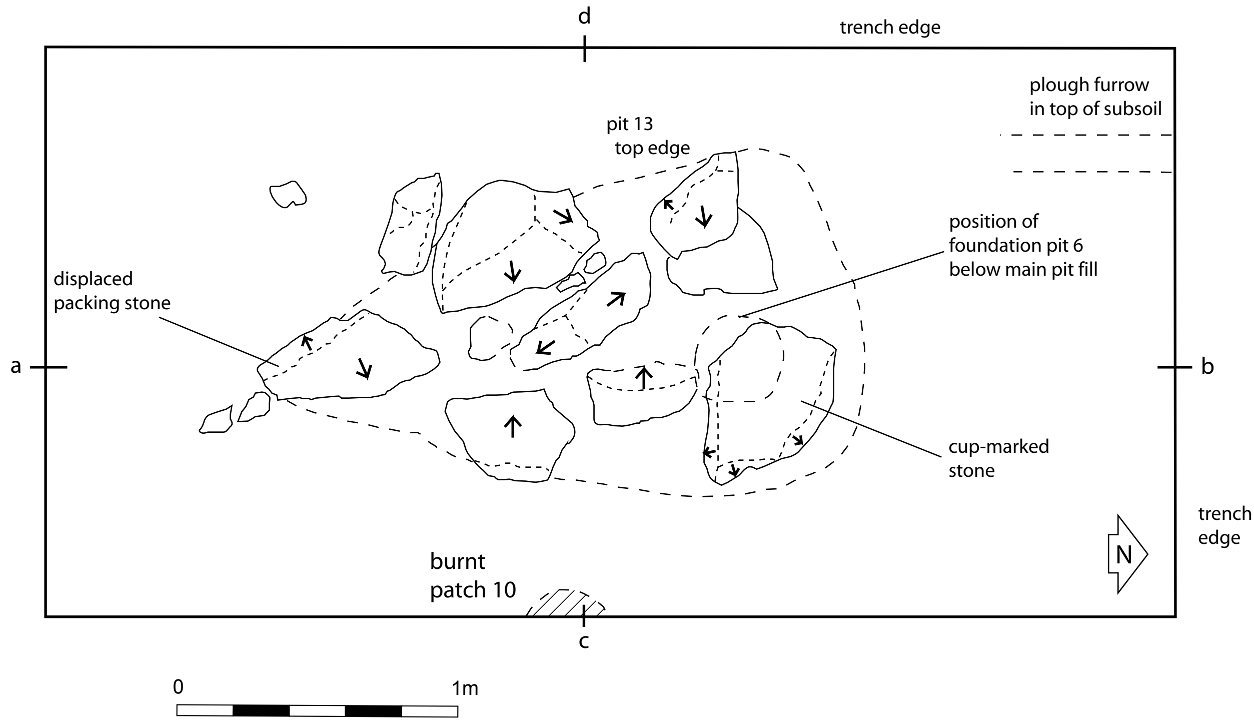

Fig. 10 Llanfechell fallen standing stone. Plan of stone pit

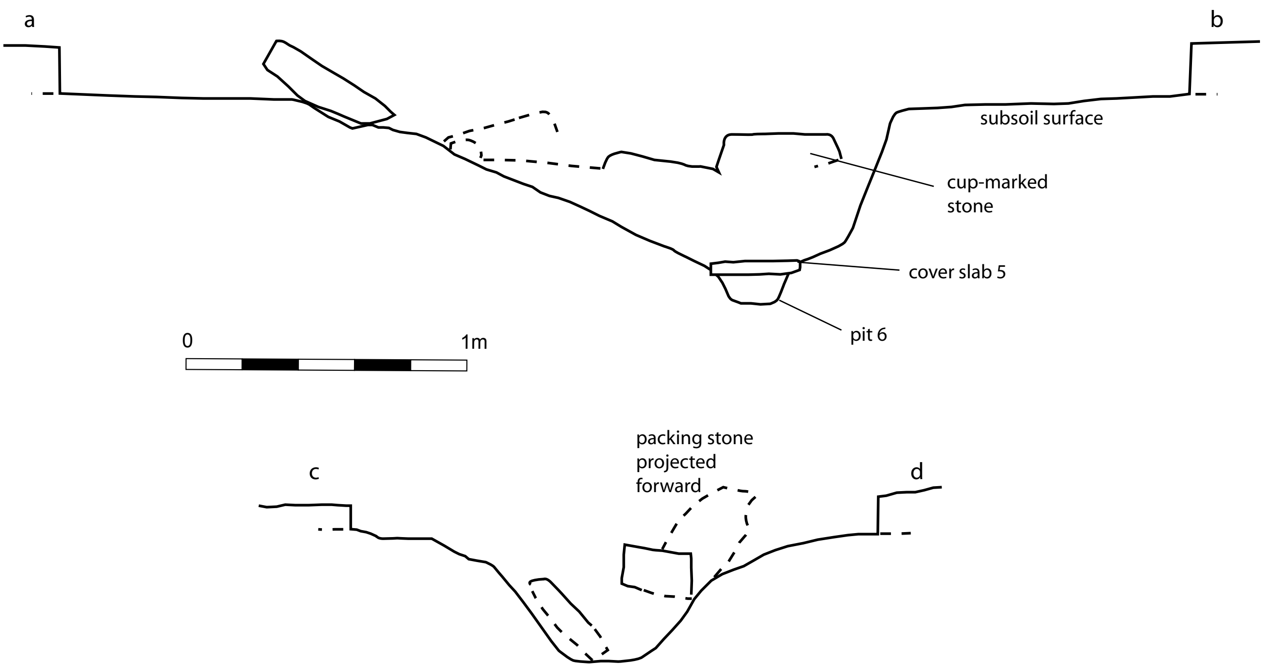

Fig. 11 Llanfechell fallen standing stone. Profiles of stone pit

Fig. 12 Llanfechell fallen standing stone. Stone pit with disturbed packing stones still *in situ*, from the east. 1m scale

Fig. 13 Llanfechell fallen standing stone. Cup and ring-marked stone. Scale with 20cm divisions

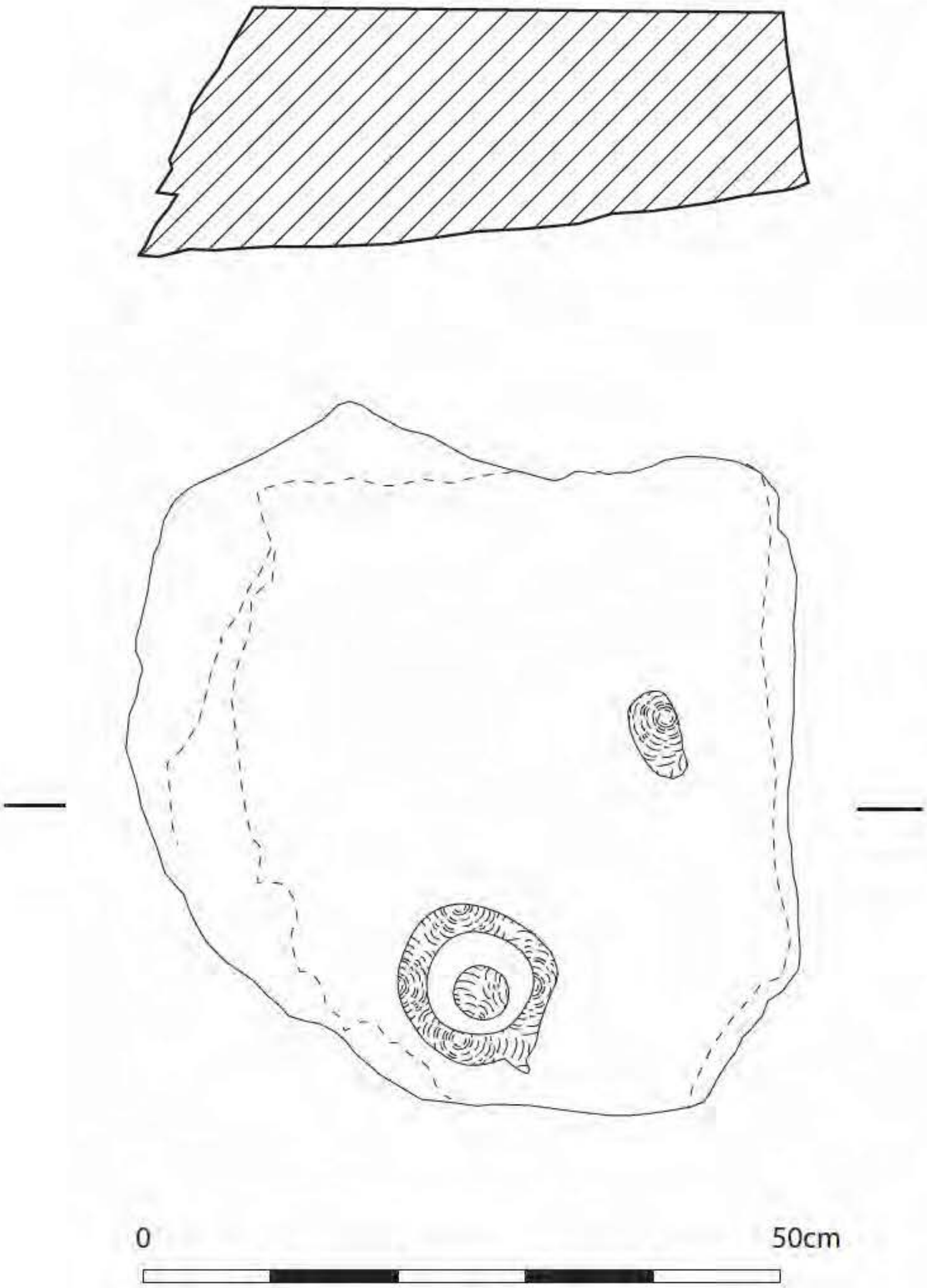

Fig. 14 Llanfechell standing stone . Cup and ring-marked stone

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