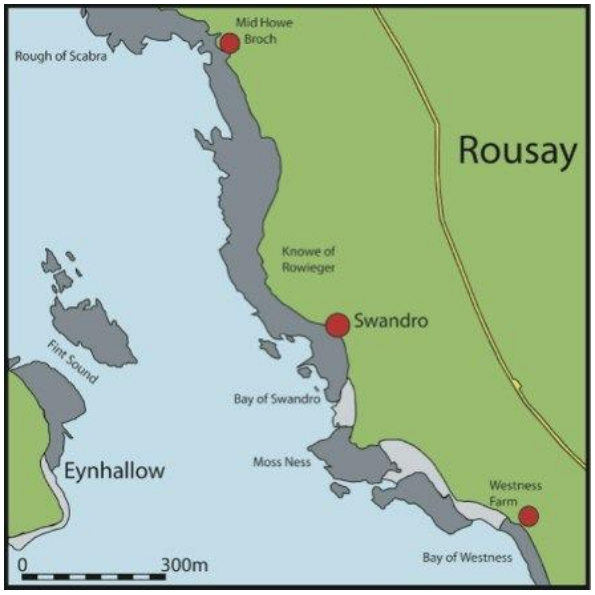
Swandro 2013

Data Structure Report

Stephen Dockrill & Julie Bond

Introduction



Location of Swandro

The Knowe of Swandro looking to the East

The Knowe of Swandro on the Orcadian Island of Rousay, (HY 3753 2966) consists of a mound with obvious stone inclusions, which is situated immediately behind a boulder beach on the Bay of Swandro. On its eastern flank is the Norse settlement site known as Westness, excavated by the Norwegian archaeologist Sigrid Kaland in the 1970's (Kaland 1993). Described by RCAHMS in 1946 as 'the much disturbed remains of a stony mound' it has generally been considered to be the remains of an Iron Age broch. At the top of the mound a crescent-shaped wall or ridge faces towards the sea, which looked like the disturbed remains of a curving wall, surrounding an area which had large tumbled stones visible in the grass. Ordnance Survey records suggested it had been investigated at some point in the past but there is no published record. The mound may have been disturbed during Radford's investigation of the nearby Westness Norse houses in the 1950's or 60's.

The Beach

As part of the project, investigation of odd stones just visible among the pebbles on the beach below the eroding site have completely changed our understanding of this enigmatic mound. The tops of stones partly buried by the boulder beach turned out to be set upright, forming part of a prehistoric building under the boulder beach around the high tide mark. Although the tops of the stones are worn and battered by the sea, the beach has partly protected the deposits and animal bone and pottery were recovered, the finds suggesting an Iron Age context. Initial clearance of the overlying beach material revealed the remains of an Iron Age structure.

This was confirmed by an AMS radiocarbon date of 25BC-AD130 at 95% confidence for carbonized barley from a midden which sealed flagging in one of the compartments. Work in 2011 enabled the nature of the erosion to be more fully understood together with an indication of archaeological survival and potential. The sea had created terraces or steps within the archaeological mound, with each of these eroded scars being covered by redeposited beach material. The terraces were formed by the resistance of the underlying archaeological material combined with the height of the beach. Climbing up the beach from the low tide zone to the eroding cliff is literally stepping through time. Areas near to the low tide mark, the earliest deposits, had suffered more extensive erosion while areas close to the high tide mark, later in the mound's stratigraphy, had suffered less.

Investigating the deposits on the beach required the removal of a large amount of stone, from small beach pebbles through to large boulders, and the student excavators coped with the hard work with good grace and enthusiasm. The eroded surfaces were cleaned in 2011, recorded and extensively sampled. The archaeology under the boulder beach was found to extend significantly in both directions along the coastline to the south east and to the north west. Sampling at low tide showed that the site also extended seawards; a depth of midden was found surviving even under the sand at the low tide mark. The building identified in 2010 had been clearly truncated by the marine erosion and a hearth predating the structure provided an archaeomagnetic date (though the date range was disappointingly wide - 590BC-AD680 at 95% confidence - due to the point on the calibration curve; it is hoped that a set of samples from a hearth sealing this one will provide a date with a much reduced range). On the north western side of the cleared archaeological surface the remains of a substantial outer wall of a large circular building seemed to form the continuation of the crescent shaped ridge at the top of the mound. It was thought that this must be the outer wall of the presumed broch.

In 2012 work centred on the coastline to the north west in order to investigate the wall more fully by clearing yet more boulders. A circular structure, composed of a number of concentric outer wall-faces, was revealed. Each arc of wall was backed by a stone and midden core. The structure of this monument more closely parallels the construction method used in Orcadian Neolithic chambered tombs rather than the expected broch. A wall running eastwards is suggestive of an outer-work leading into an entrance passage. Cutting into and sealing the top of this enigmatic monument were further Iron Age buildings represented by truncated flag floors and orthostats.

The concentric walling (2012) associated with the Neolithic Chambered Cairn, north west of the Iron Age settlement excavated in 2013.

The excavation of the seaward outer rings proved difficult, as the sea would cover these at high tide and work had to be timed to coincide with low tides, after substantial amounts of bailing. Despite aggressive erosion, shown by the worn outer faces of the walls which have been battered by the sea and the constant movement of the boulder beach, this probable chambered cairn still remains

intact, and has excellent archaeological potential, with good survival (at present) of the presumed area of the chamber and the excellent survival of archaeological bone on the site. This means that the potential for *in situ* human remains within the tomb is high and in consequence this is an extremely important site. Re-evaluation of existing tomb assemblages are currently challenging previously held interpretations (Lawrence 2013). This site offers the rare opportunity to excavate, using modern methods and techniques, a tomb which in a few years time will be completely lost to the Atlantic.

Excavation and Research objectives for 2013

Excavation objectives for 2013
The objectives included the full definition of the eroding deposits forming the wave-cut terraces seen in the excavations of 2010, 2011 and 2012 . Work concentrated on the upper building exposed by the sea and recorded in Area A in 2011 and in Area D in 2012, in order to:

1. provide an understanding of the archaeological survival.
2. define and sample the archaeology.
3. record the structural elements
4. excavate structural elements and sample the *in situ* midden deposits.

The key research questions were:
1. What was the extent of the Iron Age settlement?
2. What is the stratigraphic association with the Norse settlement and how does this inform on the question of the Pictish/Viking cultural interface?
3. The understanding of the Iron Age settlement sequence in cultural and economic terms by the excavation and sampling of the truncated archaeological surfaces.

The exposed Iron Age sequence (see page 9 for a plan of the main contexts) covers nearly a millennium and provides a unique opportunity for sampling across this temporal span.

Work planned for the Mound (Area B) in 2013 was the re-excavation of the 4 by 10 metre area and linking section to the coast, cleared in 2011. The 2013 area enlarged on this, forming an area of circa 12 by 8 metres over the mound. This would allow an assessment of the mound which would provide an insight into the spatial complexity of the surviving Iron Age elements of this site. This work was planned to allow the development of a strategy to excavate the already eroding cairn structure. Bone survival is excellent and the core of the mound, the location of the suspected chamber, is on the upper levels of the beach, presenting a unique future opportunity to record and research using modern methods the contents of a chambered cairn.


General shot of Area E (Beach) facing westwards

Excavation 2013

Area E

Area E is the beach zone exposed as an open area in 2013; this combines two areas of the beach; Area A opened in 2010 and 2011 and Area D opened in 2012. The use of a single new letter area designation allowed the zone to be treated a single area avoiding any potential spatial confusion.

After the removal by hand of storm beach material and cobble backfill covering the protective membrane which separated it from the previously-exposed archaeology, an area of archaeology was exposed on the beach which linked the Knowe to the Norse Hall. One of the objectives was to determine if the two sites were linked; the definition of the archaeology on the far eastern side of Area D under the Norse Hall was investigated in 2010 but still needed further clearance of the beach overburden at the time of packing at the end of the 2012 season. In 2013 the excavation of the beach material [3014] revealed the truncated remains of a composite wall late in the stratigraphic sequence and formed by an inner wall face [3019] and outer face [3020]. The character of this wall differed greatly from the Iron Age walls discovered at Swandro, and resembled the wall structure observed by the excavators working on other Viking Age sites such as the Brough of Birsay and Pool on Sanday. The wall aligns to the earthwork forming the visible monument of a house shape which was left after the earlier exploration of the Westness Viking buildings by other excavators. This composite wall survives only against the excavated section, with the seaward element of the building having been scoured away by the sea.

Truncated composite wall formed by [3019] and [3021]] facing south.

Cleaning and definition of the coastal section extending to the north west from the composite wall revealed a number of structural forms. In places these appeared to be nested within each other, suggesting a complex structural sequence.

A north west faced wall line [1520] displayed a slight curvature and tipped to the south east. On the eroded seaward section of this walling it appeared to cut an earlier wall face represented by [1553]. On the landward side, wall face [1520] cut [1538], a layer of small angular rubble. A southeastern faced wall [1518] appeared to correspond to [1520] , echoing the slight curvature of this wall face and suggesting an element of a structure some 4 metres wide narrowing to just over 3 metres at the point where the sea has truncated the walling. The wall face [1518] shows signs of collapse, tipping backwards on

to the material it is retaining. The rubble infill [3026] of the structure formed by these two walls appears to be the backing to the wall [1534] of a later cellular building form. This single faced wall consisted of large tabular stones; an inset within the wall line suggested the presence of a truncated cupboard. Excavation of a small area of this cellular structure confirmed the presence of a recessed cupboard missing its capstone and an intact second cupboard to the north west. The cell was not bottomed but carefully protected and packed so that the floor surface might be excavated in 2014.

The stratigraphic sequence within the cell was mainly rubble layers including [3018] sealing [3013] and midden [3032] with [3031] sealing midden [3034] which sealed what might be interpreted as being large structural rubble, [3035], which in turn sealed midden [3043]. The nature of the infill seems to suggest a rapid structured deposition rather than natural decay with abandonment. It is possible that this infill might be associated with the Norse arrival on this site. No macro cultural indicators such as steatite were recovered during the excavation of this portion of the cell, however slag, copper alloy, crucible fragments and glass were recovered, along with a copper ally strip from [3031] (SF 943). These macro indicators suggest that this later phase of settlement was of high status supporting craft specialisation.

Another secondary structure had been inserted into a pre-existing building some 7 metres to the north west, along the section. Here a pre-existing wall face [1503] formed part of a composite wall comprising [1504] (outer wall-face), [1505] (wall core) and [1503] (inner wall-face). This earlier wall appeared to have been possibly associated with a curved orthostatic line [159]. The reused element was associated with a single faced wall line [161]. The area between these two wall elements contained flags [1511] and an ash spread [1551] suggesting an upper floor. This sealed a horizontal layer of stone [3015] suggestive of a rough floor surface. Sealed under this layer, rubble [3016] sealed a layer of black ash based material [3017] which in turn sealed a layer of rubble [3025]. A cast copper alloy pin, possibly a rosette-headed pin from the first half of the first millennium AD (Foster 1989), was recovered from [3017] (SF 874). The pin is currently awaiting cleaning and conservation.

*The late cellular building (**Structure 3**) formed by [1534] backed by [3026]. Facing south.*

An orthostatic divider and doorway/passage was suggested by orthostatic setting [1510] set perpendicular to [1503] and a series of four orthostats [3052] perpendicular to [161]. Large rectangular blocks [3039] and [3037] appear to form the north western edge of this passage while the south eastern edge is formed by orthostat [3060] and blocks [3040]. Three small upright stones [3053] form a potential door sill. Within the passage, rubble [3025] sealed a layer of ash [3036] which in

*Later **Structure 2, r**eusing the wall formed by [1504] / [1505] / [1503] (left) and [1503] (right) and ash floor [3051]. Facing south.*

turn sealed a layer of flagstones [3059] forming a rough surface. The seaward side had been truncated by marine erosion. An ash floor surface was formed by [3050] within the area defined between the section and the door sill; this butts and possibly seals flags [3051.]

Further along the section to the northwest, a series of near parallel orthostatic settings comprising of [061], [069] and [159] (which seems to be associated with wall face [1503] (inner face), [1504] (outer wall-face) and [1505] (wall core)); [060], [064] and [3002]; [059] and [3004]; and [057]. Each of these cell-like zones created by these orthostatic settings were infilled by rubble; [3001], [3003], [156] and [165]. These zones were not excavated in 2013.

Orthostats [130] and [135] were set at right angles to [057] and on the section side, set parallel and adjacent to these were two other orthostats [055] and [054] which had been originally defined in the 2011 excavations. These two orthostats formed an alignment with a single faced wall [3027], which had the strong suggestion of being a secondary structure possibly contemporary with the two structures outlined above. Further to the north west a northern fragment of wall [051] appeared to continue the alignment. A passage was suggested by what appeared to be a single faced wall [3024] collapsing outward into the wall core. On excavation this appeared to be secondary, sealing an ash based layer [3013]. A large flag [3028] at the south eastern extremity of the excavated portion of the structure sealed the ashy midden layer [3013] and was suggestive of a floor surface between [3027] and [3024]. This passage structure appears to be a late component, utilising pre-existing wall

Corridor formed by [051], [057], [055], [054], and [3027] to the south and [3024] to the north. Facing west.

elements to the south. With further excavation the ash was shown to seal paving [3029] and a midden layer [2023] and orthostats [3024]. These in turn sealed midden [3042], the surface of which formed the extent of excavation in 2013.

Wall [051] conjoins [3027] with the aid of [054] and [055], two orthostats that change the alignment to that of [3027] (see above). Wall [051] appeared on excavation to be a double faced wall with five courses surviving to the limit of excavation in 2013. The construction utilises thin tabular stones in a distinctive high quality construction or build. The joints are very tight and well fitting and this differs from the build quality of other stone walls. This wall may continue, appearing under structural rubble [165], before being truncated by the large orthostat setting [157], and being cut by orthostat settings [135] and [136]. There is a possibility that this wall may pre-date the Iron Age settlement and relate to the suspected earlier Neolithic phase and the possible chambered cairn.

Excavation of the Lower Terrace

The excavation of the structural remains investigated in 2011 in Area A was continued in 2013. A series of orthostats comprising of [013], [012] and [017] appeared to form the limits of a building form truncated on the seaward side. The building (***Structure 1***) suggested by these remains was in the shape of a flattened oval with a curved side and straight element on the landward side. The seaward side had been truncated by the sea removing half or more of the structure. Work in 2013 concentrated on the excavation of the infill; in 2011 the building had only been excavated to define the structure. The apsidal northwestern end defined by orthostat settings [013] and the internal dividing orthostats [031], [025] and [024] formed the focus of this work. excavation revealed the presence of a flag floor [3049] under the flagging [042] and sealing the burnt clay [080] forming an earlier hearth. Sealed by this hearth and [042], the remains of a collapsed single face wall [3048] was discovered during the cleaning of the truncated section left by the scouring action of the sea. The wall was tipping to the north west and faced on the south eastern edge.

*The truncated remains of **Structure 1**. Facing north.*

*Orthostatic oven in **Structure 1**. Facing North*

Excavation in the corner formed by orthostats [013] and [031] and orthostat [023] and [036], revealed the remains of a stone built oven. The back of the oven and sides were constructed using drystone walling [3045]. This provided a flue and surround. This was filled by ash fills [3046] which sealed [3047]. This oven structure parallels a similar form excavated by the authors in Structure 8 at Old Scatness, Shetland (Dockrill 2003, 89).

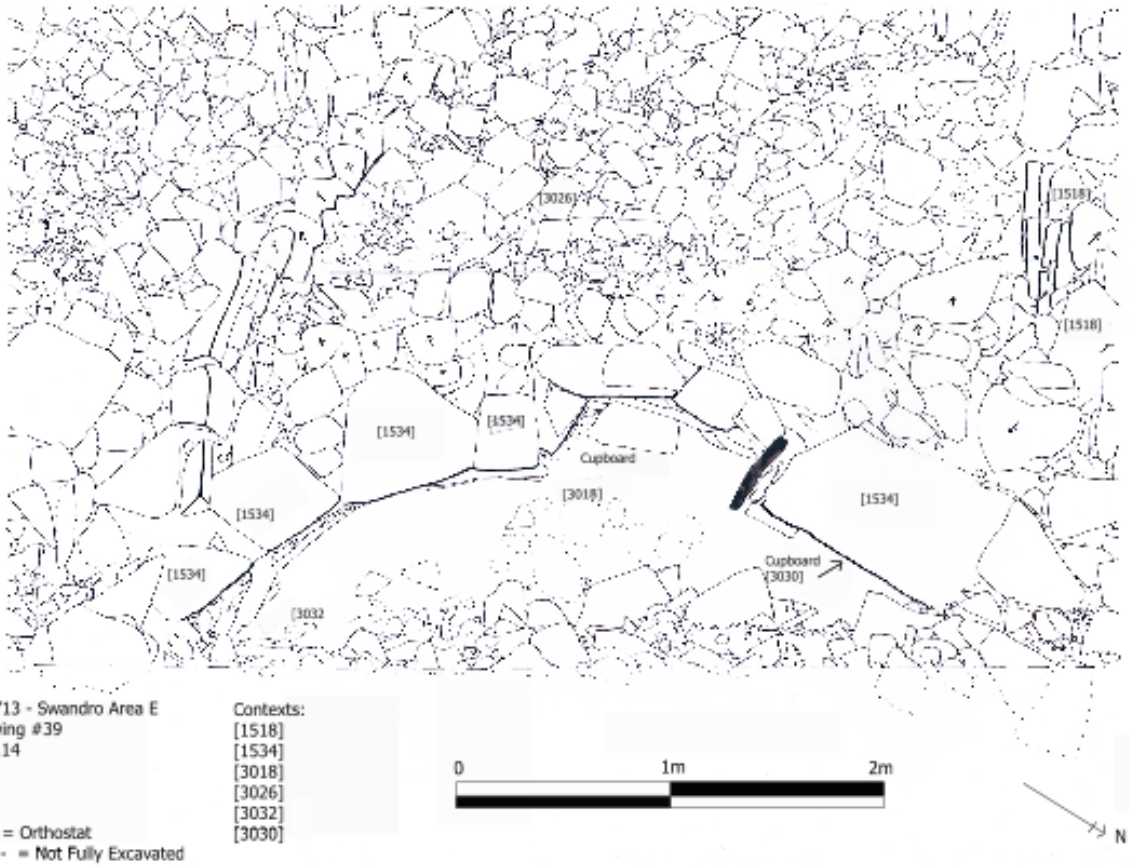
This formed the limit of archaeological work on the beach zone (Area E) in 2013. The exposed archaeological surfaces were carefully covered with a membrane and then packed with stone as a protection against the sea. This work is part of a planned two year field investigation of these deposits. It is planned to complete this element in a six week season in 2014.

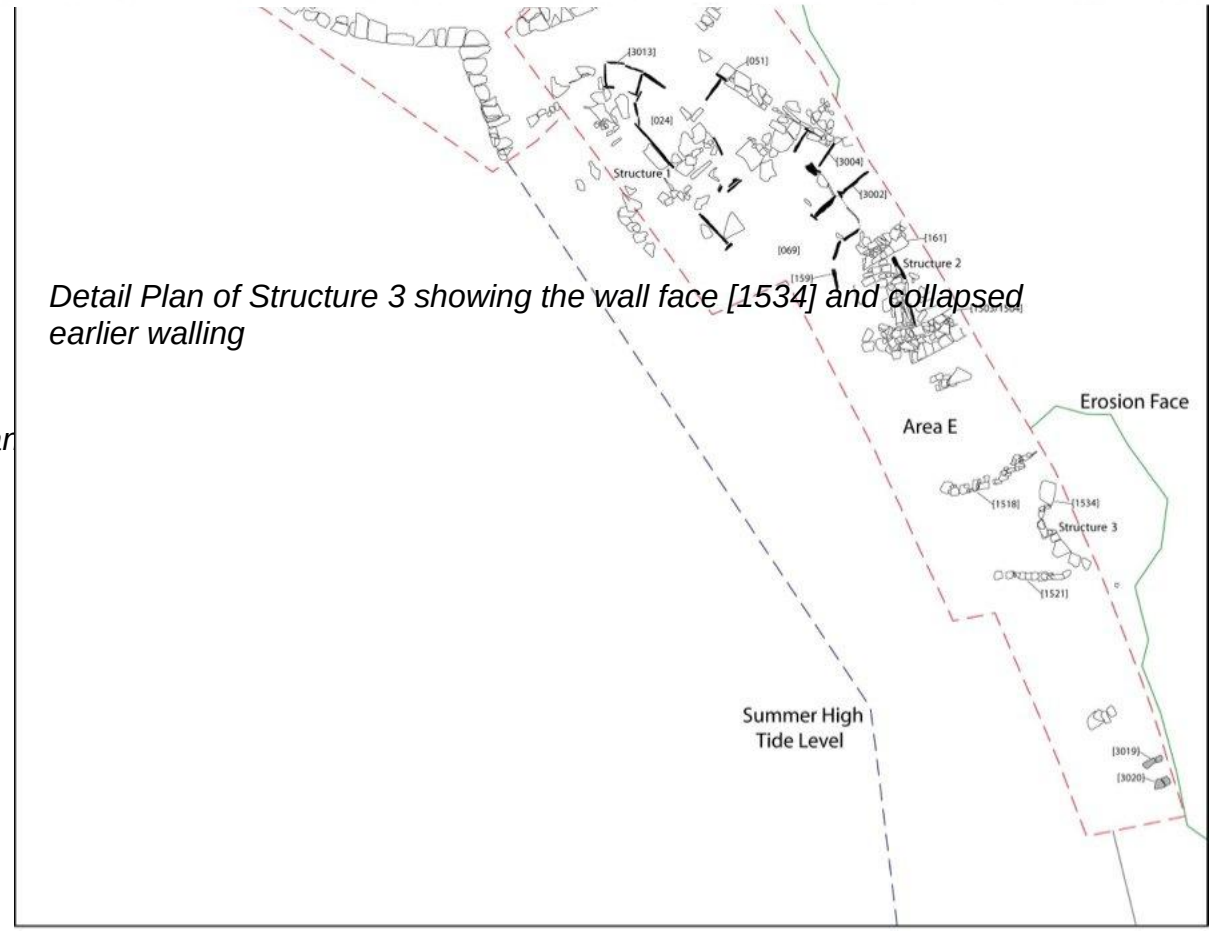
Area B

Excavation over the summit of the Knowe occurred in 2011 with the aim of identifying the nature of the mound and the top of the surviving archaeology and to confirm whether or not an earlier excavation trench had been opened in this area. No evidence of earlier intervention was found and this trench was revisited in 2013 and was slightly extended so that a fuller evaluation of the surface of the archaeology could be undertaken. This was deemed essential in order to access the survival of the interpreted Neolithic chambered cairn identified on the beach in the 2012 season. Work this year saw the removal of the covering infill to the 2011 surface and turf in the extended area. The outer faced segment of walling [1061] appeared to conjoin with the outer face of the cairn wall on the beach. The wall core appears to have been robbed, however elements of a gently curved inner face [1042] were found sealed by a mixed shillet and midden layer [1040] on the landward (north eastern) side of the trench that featured signs of possible corbelling. On the seaward side, two stretches of faced walling ran parallel to each other with other strands being faced on the seaward side. In the southern corner a series of orthostatic settings suggest structure. These are formed by [1033] , [1035], [1034], [1034], [1029], [1036], [1037], [1038], and [1039].

Area B; Scale indicating context [1040]

The central area contained by [1042] comprised the continuation of the mixed shillet and midden deposit [1040]. This appeared to seal a layer of voided rubble. This rubble was largely still covered by [1042] when the excavation was halted for the 2013 season with the trench being back filled so excavation could continue in 2014.





Detail Plan of Structure 3 showing the wall face [1534] and collapsed earlier walling

Plan

Discussion

Site Formation Processes
Observations on the survival of the archaeological sequence in the face of erosion from the sea are worth discussion. The Iron Age sequence has been terraced into levels, rising from truncated material appearing to date to the Middle Iron Age up to Late Iron Age and Norse period deposits at the upper erosion terrace adjacent to the wave-cut cliff. These terraces appear to have been in part formed by the resistant character of the archaeology; for example paved surfaces and walling, which have remained in situ even where the sea has infiltrated the softer deposits. The interpreted Neolithic cairn to the north has been subjected to extensive erosion, with the outer course being water worn and much reduced in height, whereas the blocks in the upper and inner courses are better preserved. The height survival of the courses of this cairn and of later walls dating to the Iron Age structures increases as the erosion terraces rise towards the low eroded cliff. These active eroded terraces have been covered by the sand, pebbles and larger cobbles and boulders of the beach, which is in constant motion.

Two agencies appear to be responsible for the destruction of this site; the first is the day to day tidal range responsible for the constant movement of materials in the inter-tidal zone. Tidal action may be responsible for the scouring-out of softer deposits from some features, the erosion of the edges of structural stones and the forcing of small pebbles into cracks in the structural stones which eventually leads to splitting of the orthostats. The second and more aggressive erosion is periodic and due to high-energy storm events. Although not constant, these events are extremely aggressive with the sea capable of cutting into the cliff and upper terraces and able to remove with ease structural remains (walls, paving and orthostatic features). From the pattern of the stones of the boulder beach, their size and deposition, it seems likely that the main force of these events comes from the west and that the solid bulk of the supposed Neolithic cairn has to a small extent protected the later deposits to the east of it. This does mean that in the better survival towards the cliff and on the landward side there is clear evidence that earlier walling (the suspected Neolithic chambered cairn and middle Iron Age buildings) has the potential to survive to a reasonable height, perhaps between 1 and 2 metres.

Potential of the Archaeological Sequence
Much of the excavation so far has been limited to the removal of the overlying beach material and the defining of the eroded archaeological surfaces. 2013 saw the beginning of the excavation of the archaeological material on the beach and it became evident that the earlier structures shared a remarkable level of survival, having been partly infilled at the end of their use and with cellular constructions within larger earlier forms. The survival of bone on the site is good and should, with the samples taken for archaeobotanical remains, provide the palaeoeconomic data which is so far missing from Rousay. Added to this is the importance of this site, the investigations so far having shown that this site has Late Iron Age and later deposits and is thus likely to be the settlement whose inhabitants became the Pictish and Viking burials at nearby Westness.

The sorting of heavy fraction residues from wet sieved soil samples taken from the infill of the Late Iron Age cellular building (Structure 3) during 2013 and the spring of 2014 have provide conclusive evidence for both copper alloy and iron smithing, with slag, copper alloy and iron fragments, a possible crucible fragment and possible furnace lining fragments. The presence of a macro-sherd of glass together with this evidence for metalworking suggests that this site is high status.

The impression gained from the surviving upper levels of the archaeology is that the Late Iron Age settlement may have been in part levelled prior to the construction of the Norse long house forms previously excavated by Kaland.

Work in 2014 will investigate these archaeological remains further in order to sample the floors of both the Early and Late Iron Age structures. This will provide an opportunity to understand the sites' economy and compare it with similar sites such as Pool (Sanday) and Old Scatness (South Shetland) (Hunter *et al.* 2007, Dockrill *et al*. forth. Bond 2002, Bond 2003). An important aspect will be the micro sampling of Structure 3. It will provide an important dated sequence for architectural development, material culture and the economic evidence.

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Swandro Geophysical Survey 2013

P. J. Turner

1 Introduction

Survey work was carried out between the 24th of June and the 6th of July 2013. The weather history for the previous several weeks had been largely warm and dry, leading to extremely desiccated site conditions, especially on the rocky settlement mound. Above the shingle beach, the site was heavily covered in vegetation that was cleared by cutting or trampling. The site slopes downhill slightly from the top of the beach, before sloping upwards towards the island's central peak. At the juncture of these slopes is a marshy area made obvious by the presence of reeds. The terrain is very uneven due to the presence of the settlement mound and associated near surface features.

Instruments used were:

- **The CMD Mini-Explorer (GF Instruments nd), an FDEM instrument (see below) that produced good results. Data were collected at 0.5m x 0.5m resolution.**
- **Ground Penetrating Radar (GPR) data was collected using a GSSI SIR-3000 single channel instrument (GSSI 2013), using both a 400MHz and a 270MHz antenna. Positional information was provided by an odometer wheel. Data for topographic correction was captured with a hand held GPS. Data were collected across the mound (northern-most) grid at 0.5m transects, with a sampling rate of one per 5cm.**
- **Earth resistance tomography (ERT) survey was performed with a ZZgeo FlashRes 64 resistivity/induced polarisation system (ZZgeo 2013). Unfortunately, the dry ground conditions defeated the instrument, and no useful data were collected.**
- **Resistance survey was attempted using a Geoscan Research RM85 (Geoscan 2013), but as with the ERT, no useful data were collected.**

2 FDEM data

Frequency Domain Electromagnetic (FDEM) survey works by generating an electromagnetic wave from a transmitter coil. This causes current to flow within nearby matter, in turn generating its own EM signal which is detected by one or more receiver coils in the instrument; electronics then interpret this signal to give a

‘quadrature’ response (measuring soil conductivity) and an ‘in-phase’ response (effectively equivalent to the magnetic susceptibility). Depth of investigation is determined by coil separation and orientation; an instrument with several coils can therefore record both the magnetic and electrical properties of the sub-surface at multiple depths. An EM instrument can detect: cut features (high conductivity and altered magnetic susceptibility); walls, voids and made surfaces (low conductivity).

For ease of comparison with more familiar resistance surveys, all quadrature data from the CMD has been converted from apparent conductivity (mS/m) to apparent resistivity (ohm.m) unless otherwise stated.

The most obvious anomaly is a broad area of high resistance above the settlement mound. Analysis alongside the in-phase data allows us to discern within this three separate anomalies (A, B, C). A is clearly associated with upstanding remains at the top of the Knowe, and excavation shows this to be contiguous with the line of the tomb wall excavated in the 2012 season. The second anomaly (B) shows a much altered magnetic character when compared to A; this area has a mix of very large positive and negative spikes in resistance. Some of this is certainly due to metal responses, but the scattering of positive spikes is indicative of very low apparent conductivity measurements. Paradoxically, this is likely caused by small, conductive anomalies (Callegary *et al.* 2012). This might be attributable to contamination by modern metallic objects, but the fact that these occur within a well-defined, roughly circular area that is contiguous with a clear high resistance/magnetically enhanced anomaly suggests that this effect is in fact the result of a specific anthropogenic deposit. One possibility is that the anomaly represents a metal-working deposit – another is that it is the result of a bonfire that left a scatter of metallic debris. Neither of these possibilities sufficiently explains the broader high resistance anomaly. Unfortunately excavation did not extend to this area, so no confirmation could be made.

Anomaly C is of a different magnetic character again, showing mixed values. The response is strikingly similar to the anomalies (I, see below) to the east and could represent similar construction.

South of A is an area of low resistance (D), suggestive of a chamber within the tomb/broch complex. This is possibly confirmed by excavation (See photo of Area B, above). The area of walling apparent in the east of the excavation trench is less responsive than the rest of the wall, appearing mostly in the VCP (and therefore somewhat shallower) data.

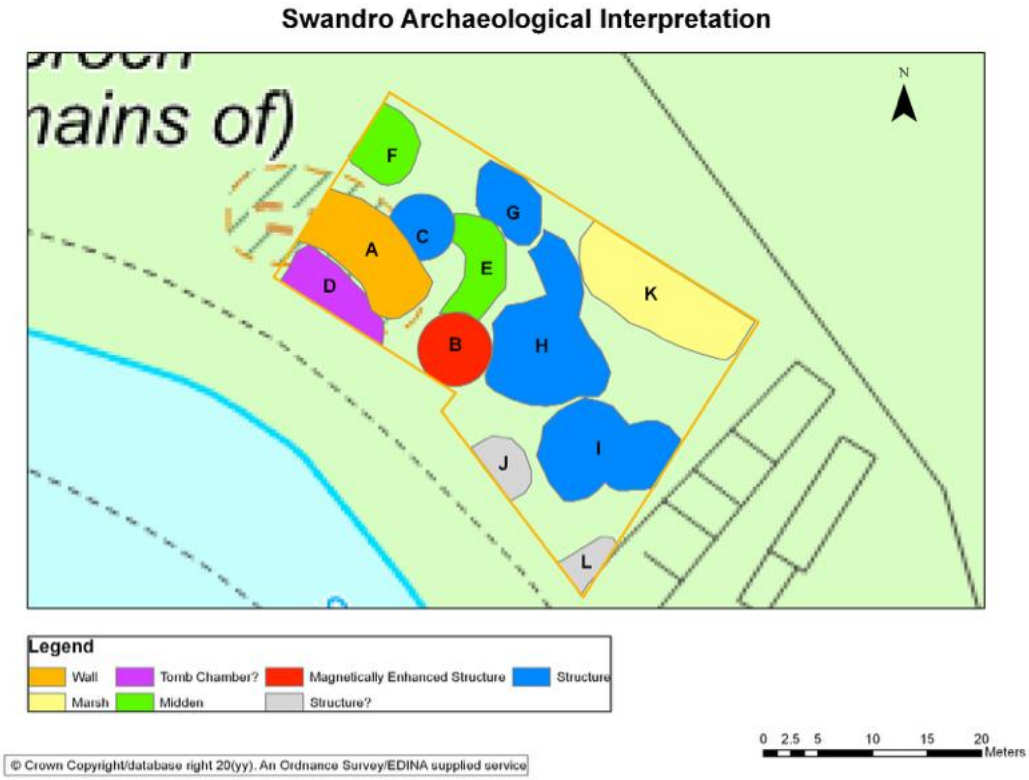

Fig. 1 Interpretation diagram for the Swandro site.

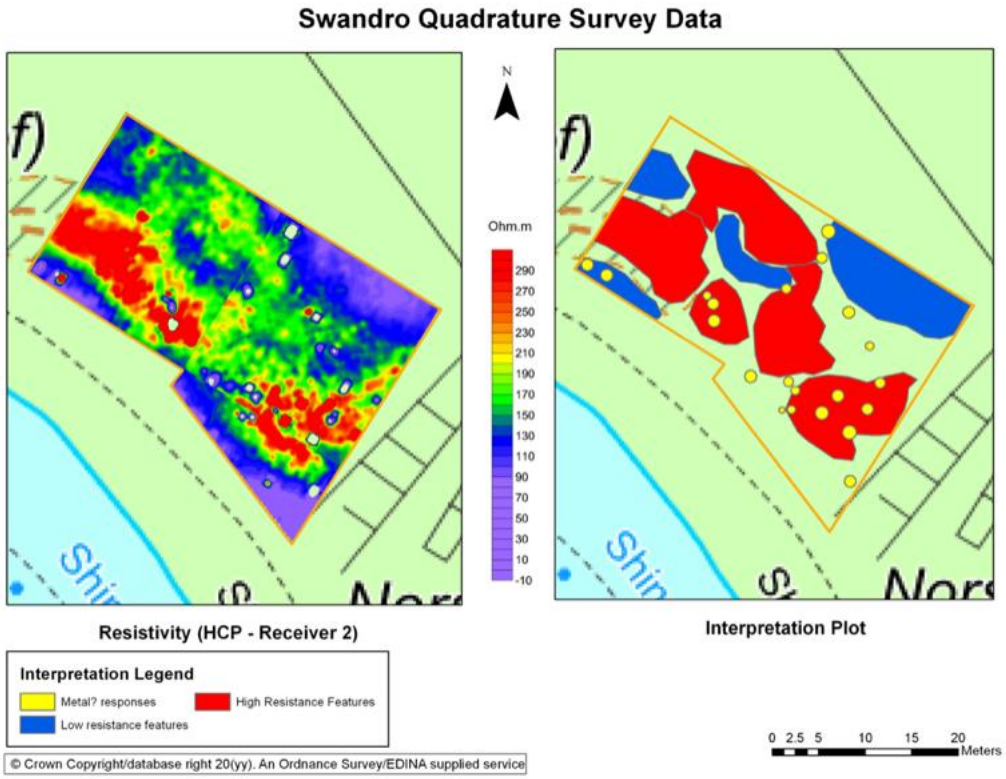

Fig. 2 Quadrature (resistivity) data and associated interpretation

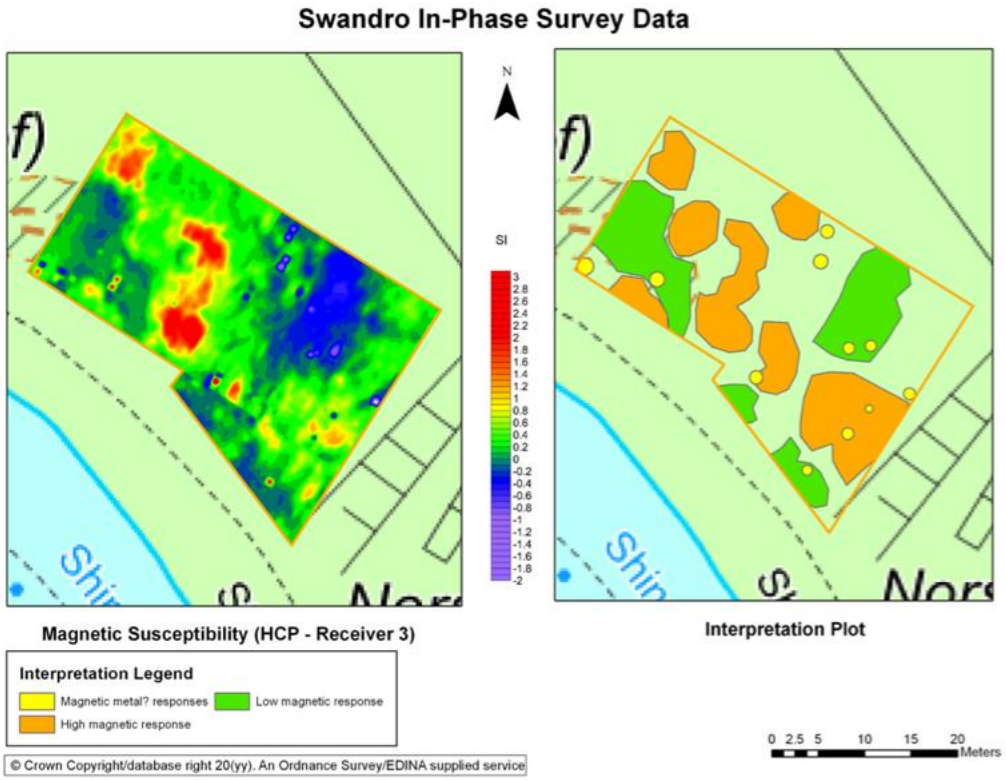

Fig. 3 In-phase (susceptibility) data and associated interpretation

Flanking C to the east and west are two areas of low resistance and relative magnetic enhancement (E, F). These may represent midden infill abutting A. Depth profiles and GPR data suggest that anomaly C is relatively shallow, and may therefore be cut into E and F. To the north-east of A is another high resistance/low magnetic enhancement anomaly G of a similar character to the wall (A), likely another structure. In the resistivity response, this anomaly is truncated by the marshy area (K) which has reduced the overall resistance in the north of the survey area. The in-phase response is less affected by this, and suggests that the anomaly extends further. In the second (hall) grid, the clearest response is the area of high resistance (I). The shape of this anomaly suggests two adjacent circular structures approximately 7 to 8 metres in diameter, which would be consistent with the known Iron Age archaeology at the site. Within these, two highly conductive responses are placed in such a position that they are suggestive of central hearths within these structures. A note of caution should be sounded however, since any detailed analysis of the shapes of anomalies is subject to the limitations of the EM system (Turner 2013:52); equally, the two 'hearths' may be nothing more than fortuitously placed metal scatter. To the north-west of I is a region of high resistance responses H that, while less pronounced, could represent further structures. The in-phase response unfortunately fails to clarify this.

The extension of the hall grid was intended to elucidate further the known archaeology revealed in section, but the quadrature response largely reveals a volume of decreasing resistivity trending away from the southernmost 'structure' within I. The in-phase data along the section edge has picked up enough variation to identify the circular structure revealed by excavation during the 2013 field season,

as well as a response in the south-east corner (L) that may be the continuation of the wall of the Norse Hall.

3 GPR Data

The GPR time slices are relatively uninformative, partly due to the large amount of scatter from the rocky composition of the archaeology, partly due to the fact that the lack of clear hyperbolic reflections means that migration of the anomalies, and therefore conversion to true depth soundings is not possible (Annan 2002:36). Better analysis can be achieved by studying individual profiles; these largely confirm the EM interpretation, and suggest that the otherwise confusing anomaly (B) does indeed relate to some kind of structure (Fig. 4). The GPR slices also provide some confidence that the apparent resistivity pseudo-sections are not too misleading (Fig. 5.5b).

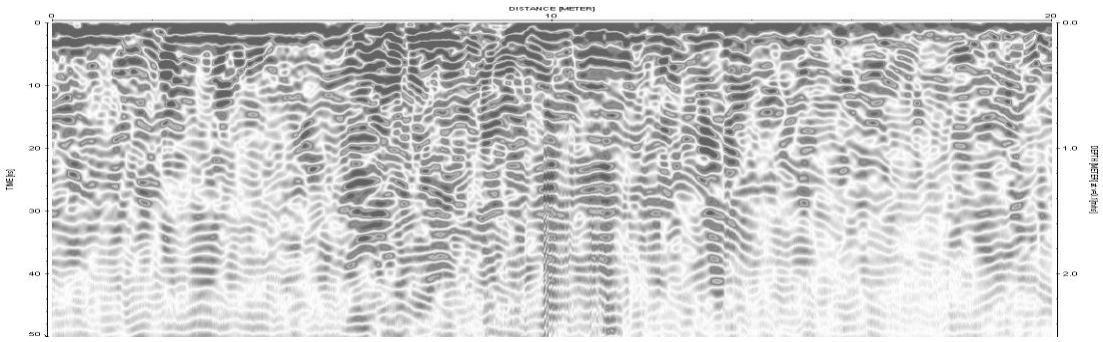

Fig. 4 (above): GPR profile at x=3.5m into the mound grid, view is towards the beach Reflections associated with anomaly **B** can be seen on the left, indicating a relatively substantial structure. The central swathe of reflections are associated with the mound wall (**A**).

4 Overview

By comparison to the complexes at Gurness and Lingro (Armit 2003:99ff), the geophysical data at Swandro suggests a compound of several different structures surrounding the central Knowe. Extending towards the Norse hall in the east is a series of structures (H), leaving a pair of ditches filled with midden material. Built into these ditches is a pair of structures B and C. Within the central Knowe anomaly (A) is a chamber (D) roughly above the centre of the Neolithic tomb excavated in the 2012 field season. In the second grid that extends towards the Norse Hall is a pair of anomalies (I) that have a morphology suggestive of a pair of Iron Age structures a few metres behind the beach section. That the section itself does not show any clear resistance anomalies despite extensive excavated archaeology might be a result of moisture alteration due to the open section. Readings across the surveyed area are variable enough in both the in-phase and quadrature data to suggest dense archaeology throughout.

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