
2 Introduction by Colleen Batey and Paul G Johnson

2.1 The background and progress of the work

The archaeological project at the Earl's Bu began with small-scale excavations in 1978 and continued in successive years as funding became available. As part of the initial survey work at the site, geophysical examination was undertaken by Harvey Watt of Durham University. The use of geophysical examination of archaeological sites was at that stage in its infancy, and methods of transcription were crude in the light of future developments. Despite detailed survey in the area which was subsequently excavated and which revealed the chamber and walling remains of a horizontal mill (eg [Batey 1993](#), fig 1, 20), no features of archaeological significance could be discerned from this work. In retrospect, the amount of disturbance and modern dumping of ironmongery from the farm, a collapsed field wall and the depth of archaeological features militated against the success of this early geophysical work.

In successive seasons, however, three campaigns of geophysical survey were undertaken in the vicinity of the site. The first, in 1989, sought to examine the area immediately adjacent to the consolidated remains of the Round Church and Earl's Bu, partially excavated by A W Johnston in 1900–01 ([Johnston 1903](#)) and again by workmen employed by the landowner William Grant in 1939 prior to the site being taken into Guardianship (see [Batey 2003](#)). Also in 1989, the nearby potential metalworking site of Lavacroon, identified by field-walking ([Batey with Freeman 1986](#)) was examined through geophysical survey, and this is to be reported on elsewhere. It was hoped that the survey of the Church and Bu area would delimit the extent of the archaeological remains sampled by the early excavation, and that it would be possible to offer some observations regarding the state of preservation of those remains.

In 1990 the survey area was expanded in order to include several areas where it was suspected, on the basis of local information, that archaeological remains might exist, and to address certain issues raised by the excavation of the site of the horizontal wheeled watermill associated with the Bu complex. One survey in this season duplicated part of one of the surveys undertaken in the previous season at a higher sampling density (reported on in interim form in [Johnson 1990](#)).

A further survey was commissioned by Orkney Islands Council in 1991 in an attempt to clarify the results of part of the 1989 survey centred on the remains of the Earl's Bu. The area covered by the earlier survey had been severely restricted by

modern boundaries and agricultural machinery, which were removed in order to facilitate the 1991 work.

The reports upon which this publication draws were written between 1990 and 1994 and revised in 1998–99.

2.2 Earl's Bu by Colleen Batey

Interventions of a quasi-archaeological nature at the Earl's Bu complex at Orphir began c1859 with the actions of George Petrie ([Petrie 1859](#)), continuing in 1900 with more extensive work by the local antiquarian A W Johnston ([Johnston 1904](#)). During these phases of work, the distinctive Round Church dedicated to St Nicholas was in part a focus of attention, but more particularly, the fragmentary walling in the vicinity. The Church and the parts of buildings were considered to be the remains of the complex described in the *Orkneyinga Saga* ([Taylor 1938](#), chapters LXVI and LXVII), including the remains of the Earl's drinking hall. Further work between 1938 and 1947 was under the charge of James Storer Clouston and W Grant, and the records from this period of work are scant, even by comparison with that which had gone before. However, walls and middens were revealed, along with a Pictish symbol stone incorporated into 'The Pend Tower', but it is hard to fully appreciate the nature and phasing of many of the fragments of walling identified in this work. All the interventions made at the site up to the 1939 phase of activity are being published elsewhere ([Batey 2003](#)).

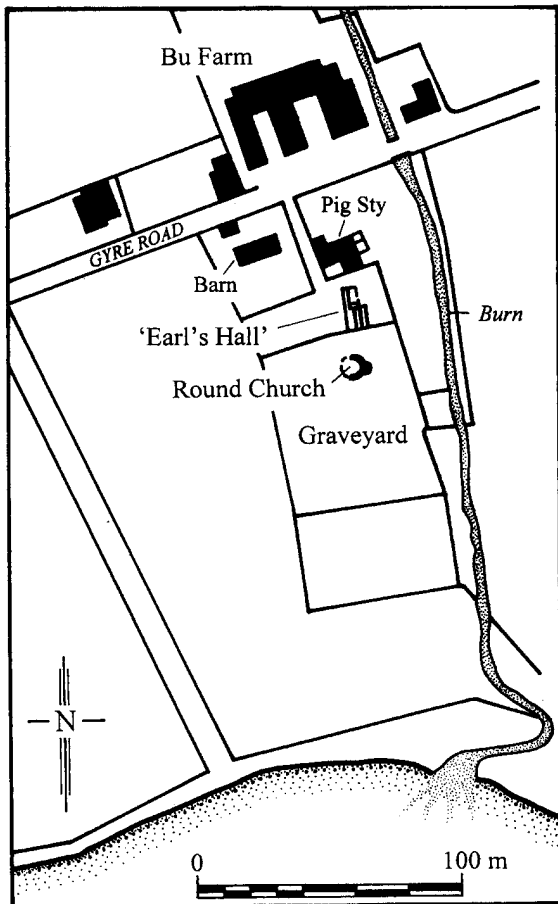
However, in 1978 the farmer alerted Colleen Batey and Chris Morris to a stone-lined passageway close by the remains taken into Guardianship following the bequest of W Grant in 1947. Successive excavation seasons revealed that this passageway was in fact the leat of a horizontal water mill, bedded on Viking midden and itself infilled by Late Norse midden material, thrown from the structures partially revealed by Storer Clouston and Grant to the south. This important work will form the subject of a further paper once the full implications of the rich environmental deposits have been fully studied (see meanwhile [Batey 1993](#)). The evidence of a Norse horizontal mill as an adjunct to this complex revealed both through earlier excavations and more recent geophysical prospection, in addition to the work at nearby Lavacroon ([Batey with Freeman 1986](#); [Johnson and Batey forthcoming](#)), confirms this site as a major focus of high-status Norse activity on the Orkney Mainland.

EARL'S BU

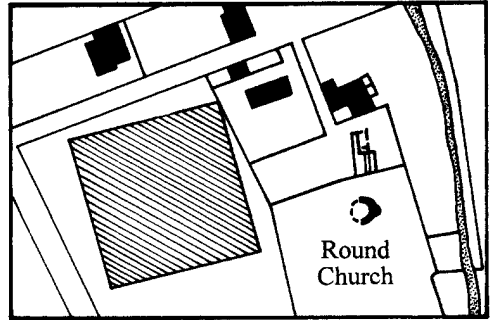
Orphir

Orkney

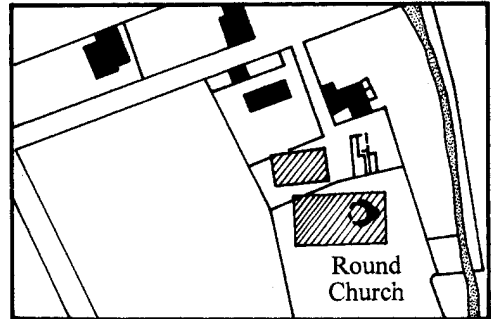
1989 - 1991



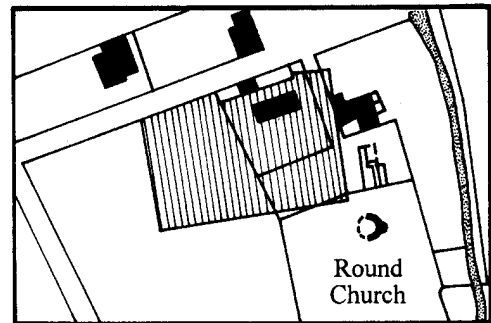
Geophysical: *West Field and Churchyard, 1989.*



Geophysical: *Guardianship Area, 1990.*



Geophysical: *West Field and Guardianship Area, 1991.*



Illus 2 Earl's Bu, Orphir, Orkney: the areas of geophysical survey (by Caitlin Evans)

2.3 Survey design and methodology *by Paul G Johnson*

In terms of the methodology employed, in all of the surveys two geoprospection systems with proven ability in archaeological circumstances were utilised: electrical resistivity survey and geomagnetic survey. In some instances, especially in 1989, they were employed in tandem, with both devices being used in the examination of exactly the same area. The surveys of 1990 were more selective with only certain areas receiving both electrical and geomagnetic surveys. The 1991 survey once again employed both systems over exactly the same area.

The sampling densities employed in the surveys also varied. All of the 1989 surveys were undertaken at a uniform sampling density of 1.0m, since this was considered to represent a satisfactory compromise between area coverage and the resolution of any feature detected in the time available for the survey. In 1990, the larger area surveys, designed primarily to locate rather than elucidate, were once again conducted at a uniform sampling density of 1.0m, but in certain areas where further clarification of potential archaeological features was considered desirable, part of the survey was repeated employing a uniform sampling regime of 0.5m. The 1991 survey was undertaken at a uniform sampling density of 0.5m only. In all cases the sites under investigation were surveyed as a series of grids, either 20m or 10m square depending upon the sampling density being employed.

The instruments employed in all of the surveys were of 'Geoscan' manufacture. In 1989 these were a FM18 fluxgate gradiometer and a RM4 electrical resistivity meter. In 1990 the same electrical resistivity system was used but a FM36 fluxgate gradiometer was substituted for the FM18. In 1991, the FM36 was again employed but an RM15 electrical resistivity meter replaced the RM4. The electrode configuration used in the earlier seasons (a resistivity meter utilising a twin electrode probe

configuration, employing a unit probe separation value) was once more pressed into service.

2.4 Data processing and presentation *by Paul G Johnson*

At the time of the surveys in 1989–91, there was relatively little choice in the mechanism for the processing of geophysical survey data in the field. Computer software designed specifically for use with geophysical data sets was fairly uncommon and few of those programs that were available could run outside of the environment of a mainframe computer. One of the most accessible programs at that time was the product graphics of the sites of 'Geoscan' in the form of 'Geoplot' which was a relatively straightforward dot-density graphics package in its first version. All of the data from the Orphir surveys were initially downloaded (or manually entered in the case of the RM4 data) into 'Geoplot' version 1 and dot-density plots produced. The intervening decade has seen huge advances in software engineering and as a consequence the data from these surveys have been re-processed several times using a number of different programs. The graphics of the data published here (Illus 3–13) are far more sophisticated than previously presented, allowing more detailed interpretation, and are the product of 'Geoplot' version 3.

All the data were treated to similar processing regimes. The individual grid data files were assembled into a site data file and then balanced in order to remove any inconsistencies between the constituent grid files. The data were then de-spiked in order to remove seriously anomalous readings and, only if considered essential, treated with a Gaussian filter, high or low pass depending upon the type of survey and the circumstances of the data set. The data were finally interpolated in both x and y directions and the image processed in order to best represent the archaeological qualities of the site. The images presented here are annotated numerically in order to facilitate discussion of the features found.