Preliminary investigations at Cata Sand, Sanday, Orkney, 2016

Data Structure Report

March 2016

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Acknowledgements

We would like to thank the people of Sanday for welcoming us to their island. In particular the Sanday Archaeology Group assisted in many ways, including working in sometimes difficult conditions. The landowners Colin and Heather Headworth kindly allowed us access to their land and provided pictures of the site and historic information on Cata Sand. Many thanks for letting us reproduce the photos here. Historic Environment Scotland generously provided funding towards this assessment work and Lisa Brown and Rebecca Jones visited us on site. Our respective universities provided additional support and funding. Scottish Natural Heritage are thanked for permitting this work to take place.

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1. Introduction

In December 2015 while walking out to visit the chambered tomb at Tres Ness the authors encountered archaeological remains on the inter-tidal zone along the eastern side of Cata Sand. At the Grithies dune (Figure 1) prehistoric stone tools were identified as well as fragments of walling, stone orthostats and what appeared to be archaeological deposits eroding out of the sand. As we walked north along a series of gravel banks on the western side of the eastern dune system we also spotted spreads of stone tools in discrete clusters in the intertidal zone. At the time we estimated that there may have been as many as 14 prehistoric finds concentrations or structures at Cata Sand. In March 2016 we returned to Sanday for a week in order to characterise the archaeology we had identified in the previous December.

Figure 1. The location of Cata Sand, Sanday, Orkney. The Grithies dune is highlighted in red. © Crown Copyright and Landmark Information Group Limited (2016). All rights reserved.

2. Methodology

Apart from this recent identification of archaeological material in December 2015, no known sites have been recorded along the eastern side of Cata Sand. Our main objective, therefore, was

to characterise the nature of the archaeological deposits and remains at Cata Sand. In order to do this we used three techniques:

1. The removal of windblown sand around the Grithies dune in order to relocate and record archaeological deposits seen on the ground in December 2015.
2. Geophysical survey of the areas where stone tools and possible archaeological features had been identified along the length of Cata Sand.
3. Walkover survey to locate and record spreads of artefacts on the gravel banks.

3. Results

3.1. The removal of windblown sand at the Grithies dune

In December 2015 we had identified archaeological material eroding out of the sand immediately to the south of the Grithies dune. Upon returning in March 2016 it was immediately obvious that windblown sand now covered these deposits. We therefore opened up a small area roughly 8 x 5m over an area where we had previously encountered archaeological deposits (Figure 2). The work involved removal of windblown sand and rather than excavation of any of the archaeological layers revealed. This simple cleaning exercise, however, produced 41 artefacts including flint debitage, Skaill knives, coarse stone tools and pottery.

Context narrative

Beneath the windblown sand (001) were a series of clear patches of a red-brown soil (003). These were found in clearly defined patches with sharp edges with artefacts occurring on the interface between this layer and 001. This context may be the remains of occupation such as flooring and/or redeposited midden. Underneath the windblown sand (001) and in between these red-brown patches (003) was a distinct layer of clean light sand (002). To the south of the trench were four upright slabs which appear to be the remains of a hearth (004). The red-brown soil (011) found between these slabs may be the hearth fill although it was similar in colour and texture to 003 found elsewhere on the site. Partly obscuring the hearth were a series of slabs which may be remains of a drain cover (006) or a paved path. A large orthostat (005) and another three upright slabs (007) were found to the west of the hearth – it is unclear at present as to their possible function. To the north-west of the trench there were stone slabs which appeared to be the inner and outer faces of a wall (inner wall = 009, outer wall = 008) filled with a dark red-brown soil (010). Two other possible walls were found: to the west of the trench a spread of rubble (013) with associated dark brown loam (014) was uncovered, and running roughly north-south across the centre of the trench a spread of stone (016) and associated dark brown loam (017) were revealed. Another, more amorphous spread of stone (020) was found to the east of 016.

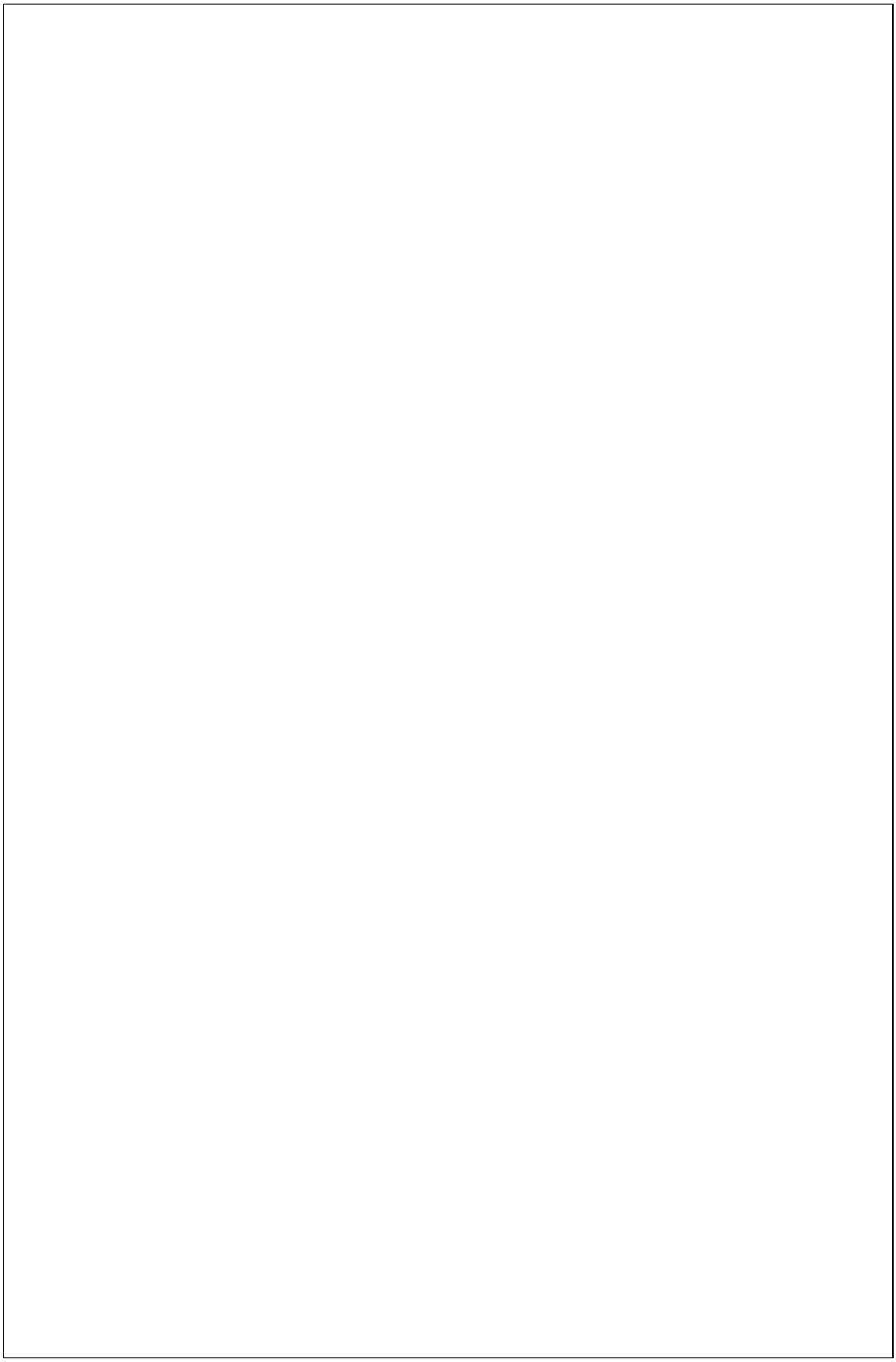

Figure 2. Multi-context plan of the archaeological contexts visible beneath the windblown sand

Three other possible features were also uncovered. Two possible postholes were found to the east and west respectively (eastern posthole cut 018, fill 019; western posthole cut 021, fill 022). A possible pit [023] was revealed within 003 to the north-east but it appeared to be filled with 002.

Figure 3. The trench being cleaned (view looking south)

Figure 4. Close-up of the hearth (004) with the possible drain cover stones (006) visible to the right. The large slab (005) is visible here to the left. Patches of 003 and the hearth fill (011) can also be seen. Animal bone can also be seen in a patch on the bottom right of the picture (view looking north)

3.2. Geophysical survey

Topography , ground condition and geology

The geophysical survey took place within the intertidal zone which consists of areas of fairly level sand, gravel and small stones. Some of the raised gravel banks which underlie and protrude through the sand were not submerged by the sea during the survey. The survey was undertaken during the neap tides.

The solid geology recorded is upper Stromness flagstone. The superficial geology on site consists of gravel storm beach partly overlain by sand. This tombolo, which links the point of Tresness to Sanday to the north, formed through the deposition of marine gravel in a series of ridges generally aligned north-south (Hansom 2003). The gravel ridge upon which the excavation took place is aligned south-west – north. It is thought that the gravel ridges were formed by c4000 years BP with subsequent sand inundation and dune formation over them by c3000 years BP (Rennie 2006).

Geophysical survey aims and objectives

The objective of this survey was to identify any buried features of potential archaeological interest in the areas where stone tools and remains had previously been observed. Magnetometry survey was selected because it is a fast and efficient method of locating archaeological features. It can identify a wide variety of archaeological feature such as in-filled ditches, pits and thermo-remnant features (ovens, kilns, hearths). Where structures were built with non-magnetic materials, magnetometry does not detect wall footings directly, but it can detect associated enhanced material such as magnetically enhanced midden deposits.

Geophysical survey methodology

The table below summarise the equipment and methodology used in the field. A detailed explanation of the methodology is presented in section 6.

Set out	
Instrument	Trimble 5800/R8
Type of correction	RTK / VRS

Magnetometer survey	
Instrument	Bartington Grad601-2
Grid size	20x20m
Sampling along the traverses	25cm
Traverse intervals	1m
Collection mode	Zig-Zag

Magnetometer survey results

The magnetometer results are presented in a greyscale plot of the raw survey data. The magnetometer survey covered an area extending north-east along the beach for 560m x 60m wide (Figure 5). The survey covered the gravel ridges where stone tools had previously been observed. A further area to the north, measuring 40m x 40m, was also surveyed over a round area of gravel protruding through the sand. The geophysical survey also covered the area to the south of the Grithies dune where archaeological deposits and walling were examined.

With the exception of the c18m diameter area of magnetic enhancement surrounding the archaeological remains exposed during the evaluation detailed above all other areas produced no response (Figures 5 and 6). The subtle linear trend visible within the image is geomorphological and relates to the gravel ridge.

The magnetic anomaly immediately to the south of the dune (Figure 6) is consistent with the presence of settlement activity which probably consists of structural remains, burning activities (probably a hearth or hearths) and the build-up of midden material. A slightly enhanced positive curving feature on the north-west side of the main anomaly may also be archaeological as it is misaligned with the general geological trend. It is possible that it could be a ditch or drain subsequently filled with enhanced material such as midden from the settlement.

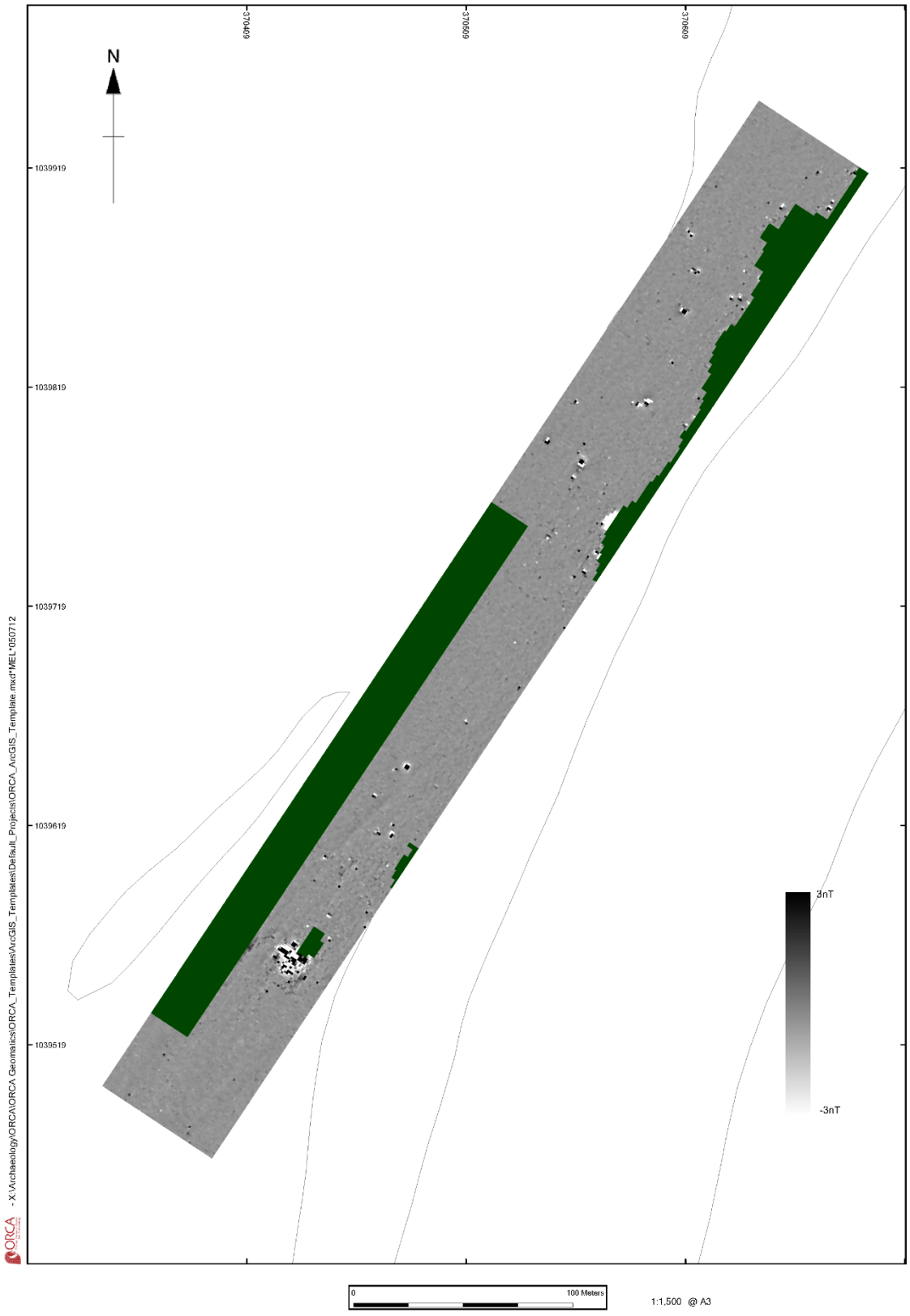

Figure 5. Full extent of magnetometry across Cata Sand

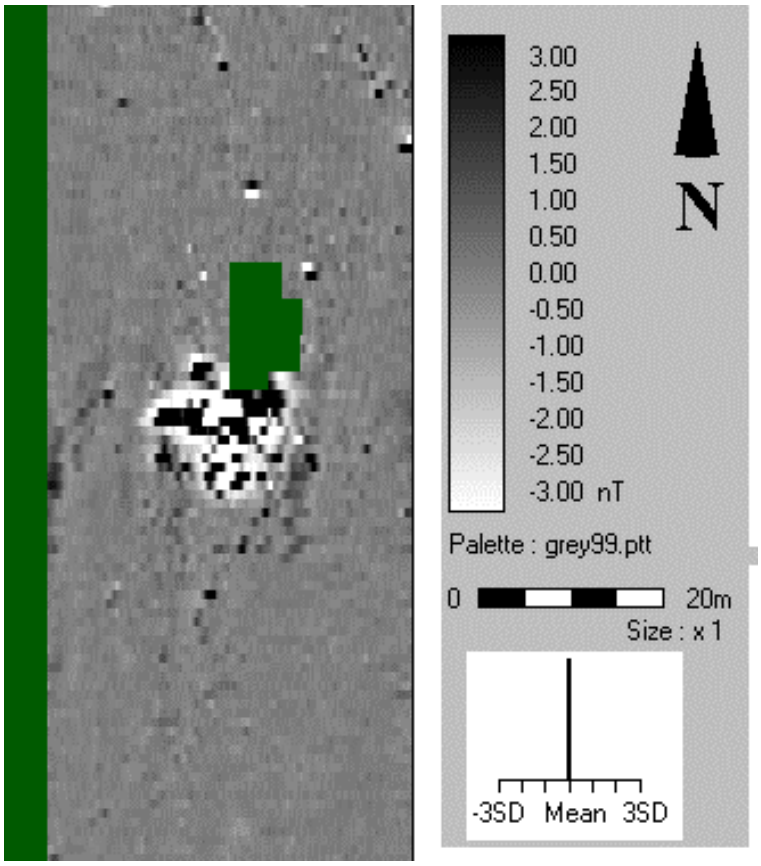

Figure 6. Detailed plot of the geophysics around the Grithies dune showing a large feature roughly 20 x 20m across. The green patch in the middle are dummy readings indicating where the extant Grithies dune is located.

3.3. Walkover survey

An artefact location walkover survey was conducted in the central area of the gravel banks at Cata Sand (see Figure 7). Where artefacts were identified they were recorded on a finds register and their location was recorded using the GPS total station. A total of 39 artefacts were recorded this way. However, only a small sample of artefacts were collected and the remainder were left *in situ* in accordance with Scottish Natural Heritage's wishes (as the area is an SSSI). The plot of these objects shows a discrete cluster in one area to the south and another smaller cluster to the north. It was intended to repeat this exercise across all of the gravel banks, however a fresh deposit of windblown sand during the fieldwork meant that surface stones were virtually entirely obscured and we were therefore unable to complete this work. This is a goal for future work in the area.

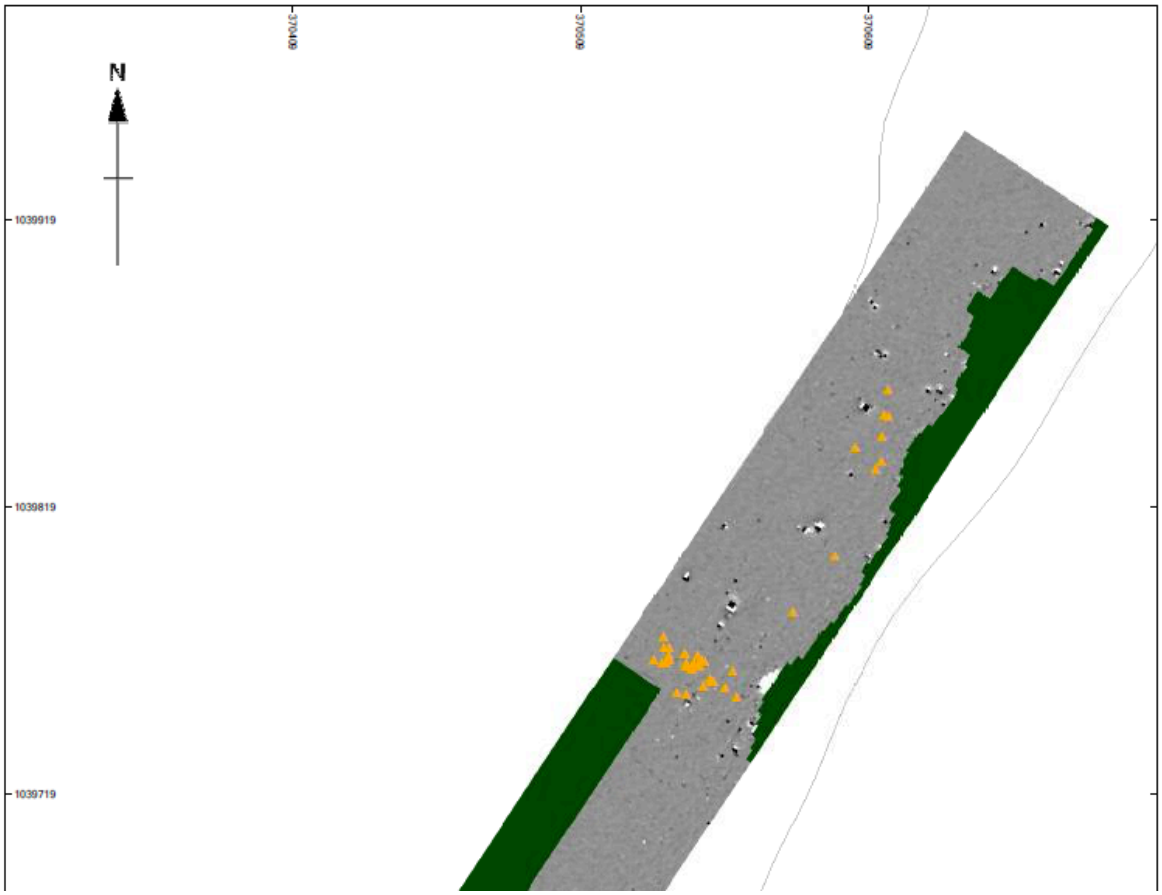

Figure 7. Distribution of finds over one of the gravel banks

4. Interpretations

It is clear that there are substantial, if eroded, occupation remains surrounding The Grithies Dune. The removal of the windblown sand in a trench immediately to the south of this dune revealed the remains of probable late Neolithic/early Bronze Age architecture and stone tools which indicates occupation. It is unclear at this stage whether the remains we found are of a single house: the geophysics results are suggestive of multiple houses clustered together, or possibly single superimposed houses which moved around over time. Only excavation would be able to resolve this. It is clear that in this area the contexts revealed have already been truncated by erosion. Prior to 2012 much of this area was covered by a much larger dune as evidenced from the 1880s map right through to the 1970s map (Figures 8-10). In 2012 the sea broke through the larger dune system to the east and washed away a substantial part of The Grithies Dune (Colin and Heather Headworth *pers. comm.*). This appears to have been the cause of the erosion of the archaeology at this location, the dune having until recently been protecting the archaeological deposits from erosion.

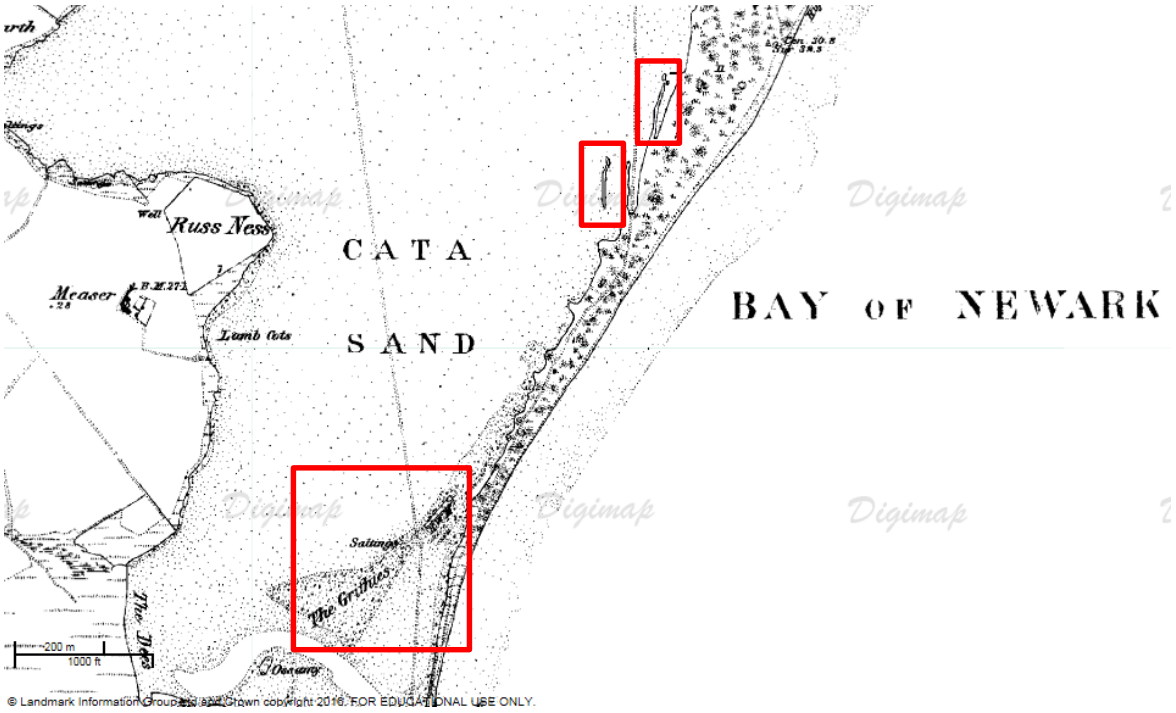

Figure 8. 1880s map which shows additional sand dunes at Cata Sand which are no longer present © Crown Copyright and Landmark Information Group Limited (2016). All rights reserved.

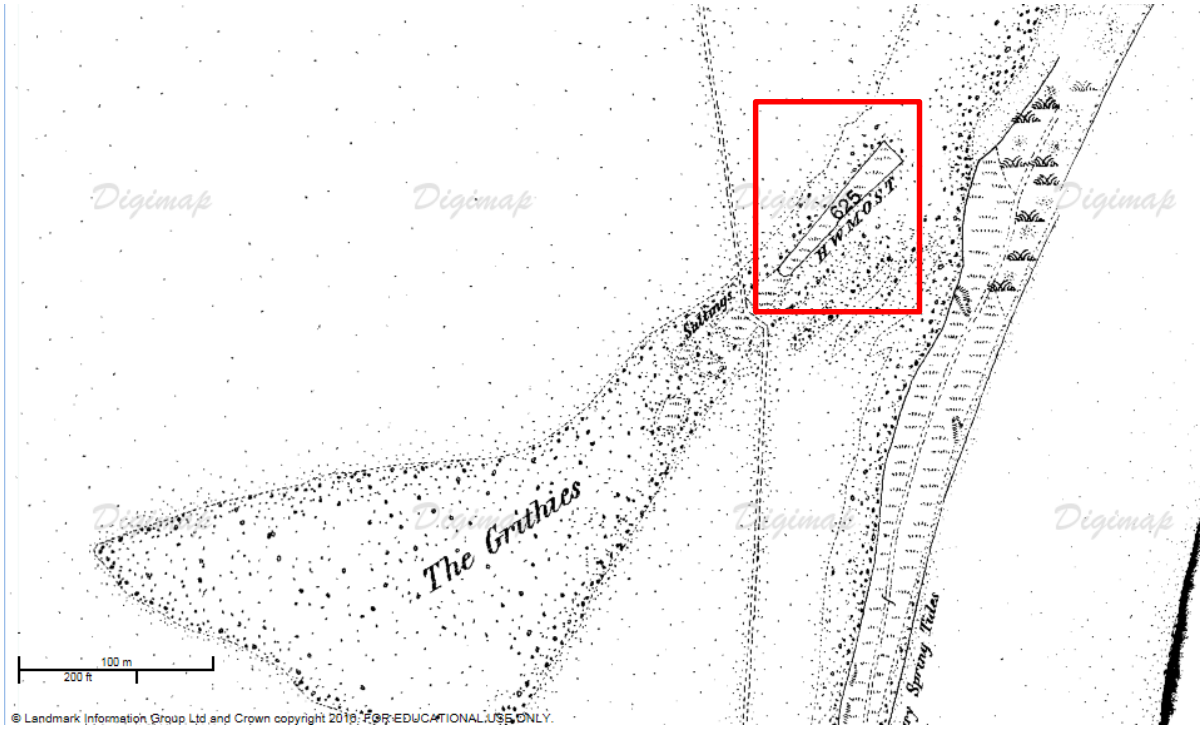

Figure 9. Detailed view from the 1880s map of The Grithies sand dune prior to 2012 erosion. © Crown Copyright and Landmark Information Group Limited (2016). All rights reserved.

Figure 10. Detail from Karl Cooper's 1970s map, showing the larger dunes in the inter-tidal zone, with a pre-2012 photo showing the Grithes dune. © Karl Cooper

It is also apparent that other small dunes were present at Cata Sand to the north of The Grithies Dune in the past (see Figure 8) and it is possible that these covered archaeological remains, the only remnant of this being the spreads of stone tools across some of the gravel banks identified via walkover survey. This may mean that there were many or other houses situated on the gravel banks but that now only coarse stone tools remain. Alternatively it could be that that the spreads of stone tools are indicative of sites of manufacture of ard points and mattocks, which gives an interesting added dimension to occupation activities in this prehistoric landscape.

The scant remains in the intertidal zone are hard to interpret as these areas have been undergoing erosion through water action for a long time. Now that the buildings at The Grithies Dune have been exposed through the removal of the covering dune in 2012, the problems of erosion are acute as remains are at times within the tidal zone, and are very much adversely affected by scouring through wind action – to the extent that the remains had been modified by erosion between first being observed in December 2015 and fieldwork

in March 2016. This would indicate that Cata Sand is being actively eroded and any surviving archaeology there at present will be completely destroyed in the near future.

5. Recommendations for further work

1. The excavation of the archaeological deposits at The Grithies Dune. These are at high risk from being destroyed as they are within the intertidal zone and may be the only surviving element of once extensive archaeological deposits at Cata Sand.
2. The analysis of all artefacts and ecofacts recovered from The Grithies Dune including the radiocarbon dating of samples to date the occupation.
3. The recording of all artefacts within the wider intertidal zone to identify areas of occupation/activity.
4. The auguring of the area up to the dunes and into sea to explore the extent of deposits and to reconstruct the prehistoric landscape.
5. The collation of SNH and previous research data to place these findings into their wider context.

References

Hansom, J. D. 2003. Central Sanday. In V. May and J. Hansom (eds), *Geological conservation review, volume 28: coastal geomorphology of Great Britain*. Peterborough: JNCC.

Rennie, A. 2006. *The role of sediment supply and sea-level changes on a submering coast, past changes and future management implications*. Glasgow: Unpublished PhD thesis.

6. Registers

Context register

Context No.	Type	Description	Date
1	Layer	Windblown sand on surface of inter-tidal zone	1-3-16
2	Layer	Clean light sand	1-3-16
3	Layer	Red-brown soil – occupation layer?	3-3-16
4	Structure	Hearth stones	3-3-16
5	Structure	Orthostat adjacent to 004	3-3-16
6	Structure	Line of stones – possible drain cover	3-3-16
7	Structure	Orthostat –threshold?	3-3-16
8	Structure	Outer wall face for wall north of trench	3-3-16
9	Structure	Inner wall face for wall north of trench	3-3-16
10	Fill	Fill of wall 008 and 009	3-3-16
11	Fill	Fill of hearth (004)	3-3-16
12	Structure	Possible wall to south (context not used)	3-3-16
13	Structure	Stones of wall? to west of trench	3-3-16
14	Layer	Dark brown layer associated with 013	3-3-16
15	Structure	Group of stone to north-west of trench	5-3-16
16	Structure	Stones of wall? in centre of trench	5-3-16
17	Layer	Dark brown layer associated with 016	5-3-16
18	Cut	Cut for possible posthole east of trench	5-3-16
19	Fill	Fill of posthole 018	5-3-16
20	Structure	Spread of stones to north-east of trench	5-3-16
21	Cut	Cut for possible posthole west of trench	5-3-16
22	Fill	Fill of posthole 021	5-3-16
23	Cut	Possible pit to the north of trench	5-3-16

Drawing register

Plan No.	Description	Date
1	Multi context plan of trench	06/09/2013

Finds register

Find No.	Context	Description	Easting	Northing	Height	Note
1	001	Flint				
2	001	Skaill knife				
3	001	Skaill knife				
4	001	Flint				
5	001	Skaill knife				
6	001	Skaill knife				
7	001	Skaill knife				
8	001	Skaill knife				
9	001	Coarse stone tool				
10	001	Coarse stone tool				
11	001	Flint				
12	001	Whalebone				
13	001	Flint				
14	001	Skaill knife				
15	001	Skaill knife				
16	001	Skaill knife				
17	001	Skaill knife				
18	001	Stone				
19	001	Pottery				
20	001	Stone				
21	001	Stone				
22	001	Stone				
23	001	Skaill knife				
24	001	Stone flake				
25	001	Stone				
26	001	Stone				
27	001	Stone				
28	001	Stone				
29	001	Stone				
30	001	Stone				
31	001	Flint				
32	001	Flint				
33	001	Stone				
34	001	Flint				
35	001	Pottery				
36	001	Skaill knife				
37	001	Hammerstone				
38	001	Pottery?				
39	001	Flint				
40	001	Hammerstone				
41	001	Skaill knife				

Photographic register

Photo No.	Date	Description	Dir	Photo by
1	1-3-16	Working shot cleaning trench	N	CR
2	1-3-16	Working shot cleaning trench	NW	CR
3	3-3-16	Working shot walkover survey	N	CR
4	5-3-16	Cleaning trench	S	CH
5	5-3-16	Cleaning trench and Colin	S	CH
6	5-3-16	Cleaning trench – multi-context	W	CH
7	5-3-16	Cleaning trench – multi-context	NW	CH
8	5-3-16	Detail of hearth (004) and (005)	S	CH
9	5-3-16	Cleaning trench multi-context	SE	CH
10	5-3-16	Cleaning trench – multi-context	SE	
11	5-3-16	Clean trench but sand encroaching	S	CR
12	5-3-16	Clean trench but sand encroaching	S	CR
13	5-3-16	003 in patches	W	CR
14	5-3-16	Clean trench now covered with sand	SE	CH
15	5-3-16	Composite of cleaned trench	S	CH

7. Geophysics methodology

Data collection

Metric survey – setout

The survey area was sub-divided into 20m x 20m grids. The corners of each 20m grid were set out using a Trimble 5800/R8 GNSS using instantaneous VRS correction providing an accuracy of c.2-3cm. Two points in each survey area were located to control quality using the GNSS before a predefined grid was draped over these points and set out accordingly.

Gradiometer survey

Instrumentation. Gradiometer survey was undertaken using a Bartington Grad601 gradiometer. The gradiometer comprises two fluxgate sensors mounted 1m apart on a vertical axis. Each sensor measures the earth's magnetic field, in nano-Tesla (nT), and the instrument records the difference between the observed readings for each sensor. By measuring the magnetic field in this manner, the dependency of fluxgate sensor upon the angle between the sensor and the earth magnetic field, the variations due to large-scale geological variations and diurnal fluctuations are filtered out. By doing so the instrument is recording subtle changes or anomalies in the earth's magnetic field caused by material in the top metre or so of the earth's surface.

Fieldwork. Data were collected at 0.25m intervals along traverses 1m apart, in 'zig-zag' fashion i.e. the direction of the traverse alternating between adjacent traverses, within a series of 20m by 20m grids which were later merged together.

Data processing. The data were processed using geoplot 3.0. 'Zero mean traverse' corrections have been applied to all the data. This process sets the mean of each line to zero. These corrections remove discontinuities between adjacent grids and striping effects within grids caused by 'zig-zag' collection of data.