CFA ARCHAEOLOGY LTD

March 2006

Commissioned by The SCAPE Trust

This document has been prepared in accordance with CFA standard operating procedures.	
Author:	Date
Approved by:	Date
Draft/Final Report Stage:	FINAL

Author: Samantha Badger MA FSA Scot AIFA
Michael Cressey HND BA MSc PhD FSA (Scot) MIFA
Jacqueline Aitken, Clyne Heritage Society
Illustrators: Pete Rix BA (Hons)
Editor: Melanie Johnson: MA PhD FSA Scot AIFA

CFA ARCHAEOLOGY LTD
Old Engine House
Eskmills Business Park
Musselburgh EH21 7PQ

Tel: 0131 273 4380
Fax: 0131-273 4381

email: cfa@cfa-archaeology.co.uk

The Extractive Industries of Brora
Archaeological Assessment

Report No. 1138

CONTENTS

APPENDICES

TABLES

FIGURES (bound at rear with the exception of Figure 1)

PLATES (bound at rear)

1. INTRODUCTION

1.1 General

1.1.1 This report presents the results of archaeological fieldwork undertaken by CFA Archaeology Ltd (CFA) with The Clyne Heritage Society and Shorewatch volunteers over a period of ten days between October and November 2005 at Brora Back Beach, Sutherland (NGR NC 905 033; Figure 1). A Project Design for the fieldwork was produced by CFA in consultation with The SCAPE Trust. The fieldwork was commissioned by The SCAPE Trust.

1.2 Background

1.2.1 Brora Back Beach has been the focus of a private study into the industrial history of Brora by one of the authors, Jacqueline Aitken (Aitken 2004). This research has led to the identification of several features of archaeological interest along the Back Beach of Brora. It has also identified several features that are at risk from coastal erosion and therefore in need of archaeological intervention.

1.2.2 Historical research has shown evidence for extractive industries on Brora Back Beach. This includes coal mining and salt production, the remains of which are visible on the ground.

1.2.3 In 2004, members of Clyne Heritage Society began detailed recording of masonry discovered on the beach. The remains appeared to be from a building, possibly from the old Salt Pans noted in this area on Farey's map of 1812. This pilot project demonstrated the ability and enthusiasm of the group and highlighted the need for further detailed survey and excavation, prior to the total loss of these important early industrial monuments.

1.3 Project objectives

1.3.1 The objectives of this project were to:

- produce a detailed plan of the industrial remains in the vicinity of Brora Back Beach;
- obtain historical and cartographic information about such industrial sites on Brora Back Beach threatened by coastal erosion and liable to be lost in the near future;
- train members of the local Clyne Heritage Society and Shorewatch groups in methods of surveying and recording the coastal archaeology.

1.3.2 The survey results obtained from this work are to inform an excavation strategy for future work within this area of Brora. Areas where sites were being actively eroded formed the focus of the current survey activities.

1.4 Acknowledgements

1.4.1 The authors express their thanks to all members of The Clyne Heritage Society and Shorewatch Volunteers for their help during this project. The authors would also like to thank Tomi Herronen for volunteering his time to carry out a ground penetrating radar (GPR) survey; Tom Dawson and Katinka Stenoff from The SCAPE Trust for their help and advise in setting up this project, and their continuing support of it; the North of Scotland Archaeological Society (NoSAS) members who kindly assisted during the project; Kirsty Cameron, Planning Archaeologist with The Highland Council, for her advice and support; Mr Whealing, the factor for the Sutherland Estate; and Mr Malcolm McCall of Inverbrora Farm without whose support the project could not have happened.

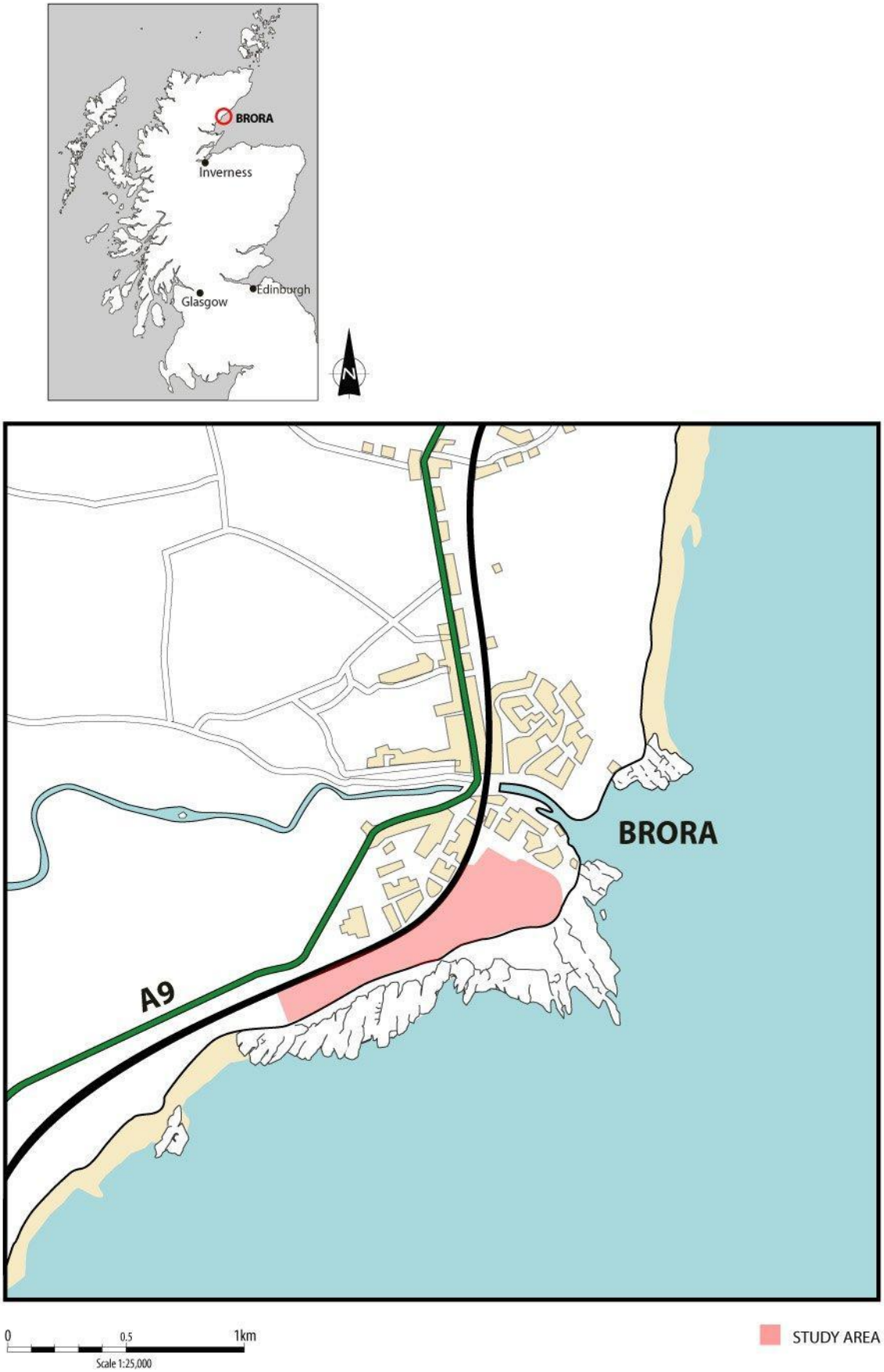


Fig. 1 - Site Location

2. METHODOLOGY

2.1. General

2.1.1 CFA follows the Institute of Field Archaeologists Code of Conduct, Standards and Guidelines. A three-phase strategy was implemented to fulfil the objectives of the project.

2.1.2 CFA provided tuition in historical map-based research, surveying and archaeological recording techniques. The Clyne Heritage Society has several members with archaeological training and it was possible to build on these skills and channel their knowledge through a series of leadership task groups.

2.2 Community Participation

2.2.1 Volunteers were involved with the project from an early stage and a flexible approach was adopted so that the members could be rotated to participate in all aspects of the project as and when they were undertaken. Over the course of the project, training was given in the following archaeological methods:

- surveying with a Total Station linked to PenMap software on a laptop to provide a digital record of site specific components and a contour survey;
- industrial earthwork interpretation and understanding degree of slope and the use of hachuring;
- rudiments of recording, including ground plan and elevation recording;
- implementing and maintaining a photographic site record;
- how to complete Shorewatch documentation and monument recording forms;
- context sheet recording on exposed cliff sections to allow stratigraphic principles to be learnt in relation to eroding buildings and any exposed domestic midden material.

2.3 Stage 1 - Desk-based analyses

2.3.1 Prior to the commencement of the fieldwork, a desk-based assessment was conducted by Jacqueline Aitken (2004). This work has provided historical information and helped to identify priorities for archaeological investigation.

2.3.2 The extent of the mining remains on Brora Back Beach was established by consulting the large corpus of cartographic evidence gathered by The Clyne Heritage Society and other documentary and cartographic resources that were available. This work was used to inform the levels and types of survey that were required. An assessment of the work already undertaken by The Clyne

Heritage Society was carried out so that their results could be integrated into the new survey and avoid unnecessary repetition.

2.3.3 In addition to the material examined by The Clyne Heritage Society, other sources were consulted. Ordnance Survey maps dating from 1872 to 1971 were consulted along with aerial photographs dating to between 1946 and 1975. The aerial photographs provided no further information.

2.4 Stage 2 - Preliminary walkover survey

2.4.1 A walkover survey was undertaken in order to establish the location of upstanding remains. Features of interest were plotted onto a base map (1:1250). Monument recording forms were completed for all identified features. The results of the walkover survey established the survey requirements and located future test-pitting and trial trenching sites.

2.4.2 The volunteers were instructed in feature recognition and completing monument recording forms. They were also instructed on how to obtain a GPS reading and how to conduct a rapid site survey using sketches and GPS readings.

2.4.3 A topographical survey using a Leica Total Station was undertaken of the Back Beach area to provide a contour plan on which to display the distribution of industrial sites and key areas where sites were eroding. The results obtained from the survey provided a modern baseline with which to examine the geomorphological changes to the shoreline, sub-tidal archaeological remains and those within the hinterland.

2.5 Stage 3 - Characterisation of eroding remains

2.5.1 Characterisation of the nature and extent of the eroding remains was undertaken. This stage involved the following elements:

- detailed section recording of eroding features;
- photographic survey of eroding building fabric;
- stratigraphic analyses of eroding structural elements to understand their development through time;
- soil-auguring to assess the extent of buried building remains within the hinterland;
- soil characterisation and description.

2.5.2 Recording was carried out within areas subjected to archaeological excavation and evaluation by the volunteers. Small-scale excavation was carried out on the eroding remains by cleaning the erosion sections to define the extent of the archaeological remains. Drawings were produced at scales of 1:10 and 1:20 or as appropriate. Context recording sheets were completed for these features.

These tasks were undertaken by The Clyne Heritage Society members and Shorewatch volunteers under the direction of the site supervisor.

2.5.3 All features examined were photographed using 35mm and digital photography. Where possible photographic recording was undertaken by Clyne Heritage Society members and Shorewatch volunteers to enable them to learn how to carry out this aspect of fieldwork.

3. HISTORICAL OVERVIEW

Jacqueline Aitken

3.1 Introduction

3.1.1 In 1598, salt pans were established adjacent to the most northerly coal pits in Britain at Brora, on the east coast of Sutherland. Salt Pans were used to extract salt from sea water which could then be used in preserving foodstuffs. This consisted of large metal pans suspended over large fires which would be used to evaporate the water, leaving a salt residue in the base of the pan. This early industrial salt production centre was short-lived and the pans were replaced in 1614. In 1768 the industry was revived at a location close to the earlier pans, both of which were marked on a mineral map by John Farey (Farey 1812).

3.2 Geological overview of the coastal area to the south of Brora

3.2.1 The majority of the study area is devoid of rock outcrop, but economically rich rocks, i.e. coal, lie beneath the surface and were readily available on the foreshore to the south of the mouth of the River Brora.

3.2.2 The oldest rocks in the immediate area are sandstone and shale of the Mid to Upper Jurassic era (around 160 Million years old) and this succession is abundantly exposed on the foreshore. The rocks are relatively shallow and dip to the east, the oldest rocks (the Brora Coal Formation) being exposed in the south-west of the area. These rocks were deposited as sand and mud from a great Jurassic winding river in its flood plain stage, flowing into the already existing Moray Firth.

3.2.3 At the top of this formation, the Brora Coal seam was deposited in a massive freshwater lagoon environment, close to the estuary of this large Jurassic river. The seam proved economically important in the history of the village. In the first instance, the coal was collected from the beach area by the locals to be used on domestic fires. It was then mined inshore, originally in ‘bell pits’ from 1529 to 1828, and latterly in deeper adit shafts further inland up to 1974. The Brora Coal mine was both the most northerly mine in the UK and the only one to exploit such relatively young coal; the rest of the UK coalfields mined Carboniferous coal of around 310 Million years old. The seam was up to 1.1m thick, but the coal was of poor quality, being very sulphurous in nature and susceptible to spontaneous combustion. It burned slowly and was very smoky. At the top of the Brora Coal seam is the Inverbrora Shale, which contains freshwater shell fossils.

3.2.4 Overlying the Brora Coal formation is the Brora Roof Bed, one of the onshore sandstone equivalents to the oil rich reservoir rocks of the Beatrice Oilfield, visible off Helmsdale, to the north east of Brora. It was deposited in a marine environment (i.e. beyond the mouth of the dominant Jurassic river) and above this bed is the Brora Shale, containing marine ammonite and belemnite fossils.

3.2.5 The interpretation of this complete sequence of rocks on the foreshore is that, with time, this area changed from a late-stage river to a deep seawater environment, indicating that the land was subsiding. This occurred due to movements on the Helmsdale Fault, around two miles inland and parallel to the present day coastline.

3.2.6 Inland, the landscape has been shaped by more recent events. Immediately behind the beach is a steep, former cliff line, backed by a flat area known as a raised beach, formed when the sea level was higher than today, since when the land has risen relative to today's sea level through the process of isostatic readjustment. Another former cliff line and raised beach can be observed slightly further inland. Both these features have been formed since the end of the last Ice Age, around 10,000 years ago, and indicate that the land has risen by around 15m.

3.2.7 Resting on the upper raised beach, and occurring randomly inland, are several hummocks of moraine. These are mounds of debris which were carried along by glaciers and dumped in situ as they melted. Other striking post-glacial features to the north-west of the area are river terraces, found close to the course of the present day River Brora. These are scars left on the landscape by the eroding river as it has cut down through the softer glacial deposits and upper layers of rock as the land has isostatically readjusted.

3.3 First mention of coal at Brora

3.3.1 In 1529, a Sutherland Charter (Innes 1529) provides the first historical reference to the existence of coal near Brora. The Charter outlines the sale of half of the lands of Doll and Carrol to John Terrell by Alexander Gordon, Master of Sutherland and son of Adam Gordon and Elizabeth, Countess of Sutherland. It states that the coal to be found is reserved by the Earl of Sutherland as the feudal superior *"…to be held for services done and to be done, reserving to the earl and his heirs the salmon fishings of the water of Broray, the sea coal found and to be found, and the 'blwidwitis'"*. This does not necessarily mean that the coal was mined at this time but local inhabitants probably carried out opencast quarrying of Brora coal as a domestic resource.

3.4 Gordon family connection

3.4.1 Lady Jane Gordon, Countess of Sutherland, and her son John, 13th Earl of Sutherland, initiated the early coal and salt industries at Brora in 1598. Brora became involved with the making of salt due to the geological fortitude of coal being found on the beach. At this time salt pans were erected, but the venture was short lived and closed a few years later. These salt pans, filled with seawater, were fired with the locally won coal to evaporate the water, leaving a residue of salt. The purpose of this process was to produce salt which was then probably used for the curing of salmon from Loch Brora, which had been recorded by Franck in 1638 (Franck 1638) as being '*very full of salmon*' and '*which they barrel up for France*'. The "*Salmon Fishings of Browray*" is mentioned in a charter granted by John, Earl of Sutherland, dated 6th August 1548 (MacLennan 1983).

3.5 Sir Robert Gordon

3.5.1 The only primary source of information, compiled over thirty years after the salt and coal industries were initiated at Brora in 1598, is a family book written by Sir Robert Gordon of Gordonstoun, Baronet (Gordon 1813). Sir Robert Gordon was learned, far-travelled and involved in the politics of his day. The following extracts from this book provide the first written evidence of salt production on Brora Back Beach.

3.5.2 Extract 1:

"There is good sea coale som half myle be-west the mouth of the river of Broray, wherewith I have seen fine salt made, which served Southerland with the adjacent provinces, and wes somtymes also transported into England and other kingdoms. Ther is a fine and excellent quarrie of frie-stone a little by-west that cole-hugh, besyd Ald-Sputy, which is carried from thence into other pairts of the kingdome."

3.5.3 This extract provides evidence that Sir Robert Gordon saw salt being made at Brora. The stone used in the construction of the eroded wall at the site of the old salt pans is thought to have come from the nearby Sputie Quarry. The quarry produced a stone which was soft, friable and of sandy quality, used almost exclusively for small country cottages in the nineteenth century.

3.5.4 Extract 2:

"This yeir of God 1598, the cole-hugh was found besyd Broray, and some salt pans were erected a litle by-west the entire of that river, by Jane Countes of Southerland, vnto whom her sone, Earle John, had committed the government of his effairs dureing his absence in France. Ther wes good salt maid then at Broray, which served not onlie Sowtherland and the nighbouring provinces, bot also wes transported into Ingland and elswher. After some few years intermission, that cole-hugh wes agane repaired and set vp by this John Earle of Southerland, and a greater number of salt pans erected ther, the yeir 1614. The cole-hugh wes first found by John, the fyfth of that name, Earle of Southerland; bot he being taken away and prevented by suddent death, had no leasure nor tyme to interpryse that work."

3.5.5 It is interesting to note that Sir Robert states that it was John, 11th Earl of Sutherland (fifth of that name), who first discovered the coal near the mouth of the river Brora. The information about this potentially earlier industrial activity is scant and it can only be assumed that the investigation carried out by John did not lead to any fruitful mining activity during his lifetime. Unfortunately the Earl and his wife were both poisoned at Helmsdale Castle in July 1567 at the hands of Isabel Sinclair, in a most bloody episode in the history of the earldom. It was not until another twenty-five years later that Lady Jane Gordon is first credited with the honour of first working the coal and establishing salt pans at Brora.

3.5.6 Gordonstoun, as he was called, boasted that Sutherland's exports included corn, barley, salt, fossil coal, salmon, beef, hides, wool, linen, tallow, butter, cheese and plaids. He also indicated that iron of fine quality is smelted from veins.

3.6 A time of progress

3.6.1 It is important to remember the crucial part played by the Earldom of Sutherland in the early story of Brora's salt and coal industries. In fact, without the early initiatives carried through by some members of the family, we would have no story to tell about these fascinating ventures dating back to the end of the sixteenth century. The early story focuses on the exploits of a few enterprising and ambitious individuals whose prestigious 'clan family', the Gordons of Huntly, were already undertaking major changes in the way Sutherland was governed, as far back as the early part of the sixteenth century. In fact, it would be true to say that Sir Robert Gordon, in particular, was responsible for changing the title of the land from the Barony of Sutherland to Sutherland-shire, the title it holds to this day.

3.7 Burgh of Inver-broray

3.7.1 These early enterprises were so successful that Brora was erected into a free burgh of barony and regality in 1601, with the usual liberties and the privilege of holding four fairs annually. The royal charter obtained in 1601 from King James VI confirmed many old grants and privileges, including the regality of Sutherland given by David II in 1347 and an earlier grant dated 1583. It can be assumed that Inver-broray was considered the chief burgh in Sutherland at the beginning of the seventeenth century.

3.7.2 These privileges were an important part of the Earl's plans to export coal and salt out of the local harbour. This sea-faring trade may have operated out of the mouth of the river Brora or, more likely, at a sheltered harbour near the salt pans called "Port a' Gheamhraidh" (The Winter Port).

3.7.3 It has been generally accepted, up until now, that Brora lost its burgh status soon after the demise of the early industries. It is known that in 1620 Dornoch became the main focus of Sir Robert Gordon's trading aspirations for the county and he even advised his deceased brother's son, the young earl, to promote Dornoch into a royal burgh with all haste. The village of Dornoch was created a royal burgh in 1631.

3.7.4 This does not mean that Brora did not still continue with some of its burghal duties. In the same letter to his nephew, Sir Robert Gordon advises him to establish a summer market at Brora, in order to bring some much-needed money into the county through trading.

3.7.5 There is, however, no evidence to suggest that Brora has lost its right to be called a burgh, and, as late as 1850, there is charter evidence to suggest that

Brora was still being referred to by this title. It is clear that more research is required to determine the legal requirements of burgh status.

3.8 Seat of power

3.8.1 It is important not to think of Sutherland as a backwater in the sixteenth century, far away from the main industrial salt-making centres across the water in Moray-shire and in the Kingdom of Fife. The seat of the Gordon earls of Sutherland was only five miles along the beach from Brora at Dunrobin Castle. It appears that they had acquired the necessary skills and experience in trade and industry to commence these Brora industries.

3.8.2 It is now much clearer that by the end of the sixteenth century there already was a powerful and prestigious family controlling Sutherland affairs and easily capable of initiating industry in this parish. In fact, Earl John carried a sword into the opening of the Parliament on 13th December 1597.

3.8.3 It is known that, while Earl John was away in France, it was his mother who looked after the family affairs and oversaw the building of a number of salt pans and bell-pits on the beach. Jane Gordon died in 1629 at Dunrobin Castle and was buried at Dornoch Cathedral.

3.9 1614 salt pans

3.9.1 As stated previously, these industries were short lived and the salt and coal works were opened anew in 1614. It appears that this second attempt at establishing these two industries was again unsuccessful and the iron of the salt pans was sold off by the estate in 1617.

3.10 End of Brora's early salt production

3.10.1 The reasons why the salt and coal industries did not succeed at the beginning of the seventeenth century is hard to define and an ultimate answer may never be found. It is clear that some events may have contributed to the demise of the industries, including the constant feuding with the Earl of Caithness, which escalated after the earl had returned to Sutherland from France in 1600. This constant battling with the adjacent county must have caused much strife in the Sutherland household and may have made it more difficult to maintain a regular workforce at the salt pans that did not fear attack from the north. It has also been recorded that a catastrophic storm struck the coastline of mainland Britain around this time and anything in its way would have been completely destroyed (Bentick, 1926). Another major blow would have been the death of the earl in 1615, when the running of the estate fell into the hands of his brother Sir Robert Gordon. Also, a continuous supply of coal for the salt production would have been difficult to maintain over a long period. The extraction of coal on the back beach would have ceased when the coal seam had become exhausted and another source had to be found.

3.11 Eighteenth-century salt production

3.11.1 Exploitation of the coal was undertaken in 1764 by John Williams, but his venture came to a close four years later. The speculation of Williams was singularly unlucky. The quality of the coal was such that, when exposed in piles to air and moisture, it was liable to catch fire by spontaneous combustion. A cargo of coal being shipped to Portsoy in Banffshire caught fire in this way, due, it was said, to the vessel springing a leak, and such was the alarm excited among his customers that they declined dealing with him any longer for a commodity so dangerous. So, after an ineffectual struggle he had to relinquish his lease.

3.11.2 Also at this time, Messrs James Robertson and Alexander Mackenzie & Co from Portsoy were granted a lease for making salt. These partners built a new salt house, which appears to have been constructed about 200 yards west of the old salt house at the junction of the beach and the links. It has been documented that the saltworkers complained of damage to firebars under the salt pans caused by the sulphurous nature of the coal. Their structure was described as "ruined" by Farey in 1812. When Williams left in 1769 he handed the responsibilities to Messrs Robertson and Mackenzie, who appointed Major Hugh Houston of Inverbrora to work the colliery. Sadly, the salt and coal lease that was about to expire was not extended, even though the industries appeared to be prospering, and the colliery and salt works were abandoned in 1777. The Reverend Walter Ross (Ross 1794) mentions the discontinuation of salt production at this period and states, "*It is to be wifhed that it were renewed with greater vigour*".

3.12 Nineteenth-century salt production

3.12.1 The last attempt to make salt was undertaken by the Marquis of Sutherland in 1812. He invested £16,000 in the four pans and the construction of a miniature railway from the coal mine to the harbour and to the saltpans. The new salt pans produced a total of 20,000 tons of salt, which averages out at a staggering 30 tons of salt derived from evaporated sea water per week. It follows that the quantities of sea water required to produce this amount of salt would have been in the order of 40,000 litres (8,500 galls) for every ton of salt. With the abolition of the tax on imported salt after the long war with France in 1823, the demand for local salt ceased and the salt pans were closed down in 1828, never to re-open.

3.12.2 The historian can glean much more information about this period of salt-making activity from the Sutherland Estate Papers deposited in the National Library of Scotland. The type of information includes employee wages, inventories of equipment and even the names and job titles of the workers themselves.

3.12.3 An article which featured in the Advertiser newspaper on 5th February 1869 refers to the uncovering of substantial structures at the site of the old salt pans. The article states that "*the sand banks along the shore have been considerably encroached upon, and at Port Cheaniraidh (winter port), a mile to the west of*

the river, the action of the sea against the banks has laid bare a row of buildings which must have been for ages lain imbedded in the sea". This extract seems to imply that buildings associated with the salt production were not visible for an unknown period before the date of the article. This event took place over fifty years after Farey visited Brora, and may be the reason why Farey was unable to depict any structures at this site in 1812. The uncovering of this site on the Back Beach at Brora must have caused quite a stir as the article ends by stating "*Numbers of people flock to visit this long hidden relic of the ancient glory of Brora*".

3.13 Gaps in the historical picture

3.13.1 No records or documents are available for the people who worked in these early industries, so there is no written evidence to tell us how they made salt in 1598 or where these workers came from, e.g. local workmen or skilled labour from Huntly and the surrounding area. To find out what these processes were like we have to explore the salt industry in other parts of Scotland in the sixteenth and seventeenth centuries, and this research will help us understand what processes may have taken place at Brora during the first phase of salt making on the Back Beach.

3.14 Map Evidence

3.14.1 A list of all the maps consulted is provided in the references (section 9.2) at the end of this report.

3.14.2 The earliest map evidence for salt pans in this area is from a map by Herman Moll (1745) of Sutherland and Caithness, which states, *"here are Mines of excellent Coal and Salt Pans"*. This suggests that salt was produced during this period.

3.14.3 Two maps depict buildings at the site of the old salt pans on the Brora Back Beach foreshore. Taylor and Skinner's map of 1776 states the name '*Salt Pans'*, and also depicts three buildings (different sized rectangles) at the same location. It is possible that the large building on this map may be connected with substantial wall remains located on the beach. Clyne Heritage Society's 2004 survey (Aitken 2004) showed this wall to be at least 30m long and it is hoped that the full extent of the structure will be determined by future survey work. It is possible that this building is a large pan house consisting of more than one fireplace, which is in contrast to the smaller individual pan houses excavated at St Monans, Fife, in 1995-6 (Yeoman 1999). The other two buildings on the map may be the salt man's house, as depicted on an estate plan by John Farey (1812), and a salt store.

3.14.4 The other map that depicts buildings at the salt pans site is a Sutherland estate plan dated to c.1772 (Sutherland Estate Tutors c.1772). This is an unusual find and it is presumed that it was completed by the tutors of Elizabeth, Countess of Sutherland, who was only an infant at the time and residing in France. This plan clearly shows a large rectangular building running parallel to the coastline and three other associated buildings behind on the grassy links.

The large building is called the *'Salt Pans'* and a small dark circle is depicted just to the east of this building, which may be a water reservoir.

3.14.5 An estate plan by John Farey (1812) does not depict buildings at the site of the old salt pans (Figure 2). This is unusual as the map is otherwise very detailed and other buildings are clearly depicted as roofed and unroofed. It is unclear what has happened to the salt pan buildings between 1770 and 1812 and why Farey is unable to depict any structures on the coast. It is possible that the buildings were demolished or taken down and the material reused, or the site had become quickly engulfed by sand. It has been suggested by the current author that the salt pan buildings were once inside a sand dune and the gradual effects of coastal erosion have helped to reveal the walls that are visible today. It is clear that the walls have been uncovered for some time but there is no strong oral tradition associated with the site in the village of Brora and it is only assumed that they belong to the salt pans. It is possible that a major storm event took place in the past covering the site, and that Farey only recorded the fragments of the site that had been revealed by 1812. Evidence for this comes from his report when he states *"The Air Pit belonging to the works, about 70 yards SW of the Coal Pit, has been covered and hid by the beach and sand thrown over it, by the high tides of late years; which, as well as the Old Salt-House, whose fire-places are now washed and covered by the waves of every Spring tide…"*. Farey's very detailed map also depicts coal pits and associated industries, i.e. limekilns, of the Inverbrora Coal Works.

3.15.6 The four pan houses erected around 1812 nearer Brora harbour are depicted on three different maps and it seems clear that the buildings were connected to each other, maybe in the form of a long building separated by internal walls or adjacent buildings. The plan of Brora Town and Harbour dated 1811-13 gives an insight into the type of building proposed for the salt pan complex that was to be built a couple of years later. It is not known if this exact building plan was adhered to or whether there were alterations to the original design. It is interesting to note a particular depiction on the Plan of Allotments in the Parish of Clyne dated 1821, which shows another large building at the salt pans site and it is possible that more salt pans were built between 1812 and 1821.

3.15.7 The later map sources for this area add little to the information on the salt industry. The 1st edition OS map (1872) depicted a disused coal pit in the north-east corner of the site. The 2nd edition (1906) also depicts this coal mine as an 'old shaft'. The 1963 OS map does not depict any features directly linked to the salt industry but does show the radio station, the construction of which may have disturbed any remains of the salt pans in this area. However, the 1971 OS map depicts the remains of the coal shaft in the north corner as well as the site of the 'Old Salt House' to the north of the radio station.

4. PREVIOUS WORK

4.1 General

4.1.1 An initial phase of work was carried out in June 2004 by The Clyne Heritage Society, North of Scotland Archaeological Society (NOSAS) and other interested volunteers (Aitken 2004). This project set out to record and survey the remains of a wall of unknown extent and purpose located on the Brora coastal foreshore and threatened by coastal erosion. It was already known from documentary sources that this specific area was the location of salt producing industries dating to 1598, 1614 and 1768.

4.1.2 The wall consisted of large, dressed sandstone blocks covered by windblown sand and an upstanding section of mortared wall, which probably formed part of a large building. The wall appeared to be of substantial construction and had been visible for at least 30 years. A record had been compiled of the wall using photographs and sketches spanning over 30 years. The wall had become visible due to the effects of coastal erosion.

4.1.3 The continual effects of coastal erosion and storms had prompted the survey of the site before it disappeared altogether.

4.2 Results

4.2.1 The results of survey work carried out in June 2004 at the site of the old salt pans on Brora Back Beach revealed the remains of a substantial stone wall of over 30m in length. Most of the upstanding structure had collapsed, but a well-constructed doorway with door jambs made from finely dressed, bevelled sandstone blocks was still evident.

4.2.2 The remainder of the wall was exposed by removing windblown sand which revealed one to two courses of wall surviving above foundation level. The foundation stones appeared to jut out about 15-20cm beyond the seaward side of the bottom course of the wall, i.e. on the interior of the building.

4.2.3 A double-skin construction method had been adopted for the wall, with a rubble infill. Most of the blocks were roughly dressed and tool marks could clearly be seen on some of the other blocks lying on the beach. Larger sandstone blocks made up the outer faces of the wall, which was generally around 1m wide. It was also evident that larger sandstone blocks, nearly 1m wide, were used in the wall's construction in places, instead of the usual double skin construction. The infill consisted mainly of small pieces of sandstone as well as rounded stones from the beach. These infill stones were incorporated into a mix of hard, white, shelly mortar.

4.2.4 A possible turn in the building was found heading towards the sea from the coast, suggesting that most of the structure had eroded away, leaving the front wall and entrance partially engulfed by a large sand dune, which is also being eroded.

4.3 Conclusions

4.3.1 The survey failed to reveal the true extent and nature of the wall. Further work was required to determine whether this wall and a large rectangular building depicted on two maps (Taylor and Skinner 1776; Estate Plan 1772) as were the same building. It is possible that the large building depicted on these maps may be a salt girnal or it may have been subdivided into different pan houses.

4.4 Recommendations

4.4.1 Several recommendations were made after this first phase of activity, which were taken into consideration for the present phase of assessment. The recommendations were as follows:

- a geophysical survey over the deflated areas on top of the sand dune complex at the site of the salt pans to determine whether there is evidence of built features and walls inside the dunes;

- a follow-up survey for another eroding building nearby with a flagstone floor;

- the doorway and ashy deposit and the upstanding part of the wall were to be protected from further effects from the incoming tides by using sandbags to protect these areas from subsidence and collapse. The site was to be monitored on a weekly basis until the sandbags were in position and then a monthly monitoring strategy was to be undertaken at the site. Progress reports were to be sent to Tom Dawson (SCAPE) and Anne Coombs (Historic Scotland).

5. ARCHAEOLOGICAL FIELDWORK RESULTS

5.1 General

5.1.1 Thirty-six sites of archaeological interest were recorded during the desk-based assessment and the walkover survey of the study area (Figure 3). The site numbers are in bold in the following report and are described in full in Appendix 1. Three digit numbers in bold relate to contexts within features and a full list can be found in Appendix 2.

5.1.2 A detailed Total Station and photographic survey was conducted of these sites and monument recording sheets were completed for all visible features by the local volunteers.

5.1.3 A full topographical survey was carried out over the study area which included the coastal edge, the dune edge, the raised beach and any other distinctive features in the landscape. This was coupled with a contour survey to show the overall nature of the study area (Figure 4).

5.1.4 Marker posts were established along the coast in order to monitor the coastal erosion. Fourteen marker pegs were placed along the length of the coast from the radar station in the north-east to the south-western extent of the survey area. The locations and details are shown in Appendix 6 and on Figure 3.

5.1.5 Specific tasks were proposed for some of the features identified in the desk-based assessment and walkover survey. They were as follows:

- detailed scale drawings of the possible eroding salt pan remains;
- an auger survey between the 'Saltman's House' (site **19)** and the coast to trace the extent of a midden that was recorded eroding out of the section;
- an auger survey along the route of the boundary wall (site **8)** depicted on Farey's map of 1812, running north-east to south-west across the 'Saltman's House' to ascertain its extent;
- an auger survey in the sand dune above the eroding buildings (sites **2** and **4**) to ascertain their extent;
- a general auger survey over the area of the old golf course in the eastern part of the study area to see if any industrial remains were present in this area.

5.2 Radio station

5.2.1 There are several features related to the radio station located at the north-eastern end of the study area. The radio station itself (**35**) was built in 1939 and was originally used as a post office. It was converted into a military listening station at the start of the Second World War. The radio station as a whole included the building itself and numerous radio aerials or masts.

Several of the aerial bases are still visible today (**24**, **27**, **32**) though many have been buried or removed since the station went out of use in 1986.

5.3 Coal pits

5.3.1 There are numerous coal pits recorded across the study area. Many of these (**14**, **15**, **18**, **21**, **26**, **28**, **29**, **31**) are identified as the coal pits recorded on Farey's map (1812). Only one of the coal pits (**16**) identified during the field survey was not depicted on Farey's map or any other maps. Pit **29** is also depicted on the 1st edition OS map though none of the others are shown. It is possible that the majority of these coal pits relate to the saltworks within this area. The coal was of poor quality and was, therefore, of little commercial value.

5.4 Boundaries

5.4.1 Four walls or boundaries were identified during the desk-based assessment and field survey. Wall **1** runs approximately north to south across the study area, separating it into two parts. It is only visible on the beach where it is eroding out of the section. The line of the wall is currently marked by a modern fence line. Boundaries **8** and **9** appear to relate to the field boundary depicted on Farey's map (1812) though the corner is now missing, presumably having been eroded out of the coastal section. The 'March Stones' (**11**) depicted on Farey's map (1812) are still visible as a line of large boulders running into the sea from the coastal edge. There is no trace of this boundary running from the coast to the hinterland.

5.5 Buildings

5.5.1 Several buildings were identified during the desk-base assessment and field survey within the study area. Buildings **2** and **4** are discussed in detail below and are probably related to the saltworks. A limekiln (**17**) is depicted and annotated 'Old Limekiln' on Farey's map (1812). A small rectangular structure was identified at this location lying on the edge of a large coal pit (**18**) during the field survey. A large rectangular building (**19**) is depicted and annotated 'Ruins of Saltman's House' on Farey's map (1812). The turf covered footings of a building were identified at this location during the field survey

5.6 Middens

5.6.1 Several middens were identified during the field survey of the study area. A midden (**3**) consisting of industrial material was recorded eroding out of the cliff section. It is described in more detail below. Middens **5**, **6** and **7** are all located close to one another along the coastline. They vary slightly in their content though all appear to contain building debris, possibly related to the use and demolition of the 'Saltman's House' (**19**) which is located inland from the middens. The extent of these middens was not ascertained during the field survey. Midden **36** covers a large area around and beneath the radio station

(**35**) though the extent is not certain. It was used as the village midden until the radio station was built on top of it in 1939.

5.7 Miscellaneous sites

5.7.1. Several other features were identified during the desk-based assessment and field survey. A harbour (10) is depicted on Farey's map (1812) and is know as the 'Winter Port' or 'Port a' Gheamhraidh' in the Gaelic language. It is visible as an area of beach that has been cleared of stone. Two trackways (12, 23) are depicted on Farey's map (1812) and were identified during the field survey. They are no longer in use but may have originally been the main access to and from the beach area. Two large clearance heaps (13, 20) were recorded during the field survey, both of which are located near the top of the raised beach beside farmland. A discrete pile of turf-covered stones (22) was identified during the field survey, the purpose or origin of which is unknown. A small embankment (25) was identified at the base of the raised beach. The function of this site is unknown but an aerial base (24) was identified lying on top of it. A saltworks is recorded on the town plan (1811-13) within the north-eastern extent of the site. The location of this saltworks (30) is also recorded on the later OS maps but not the 1st or 2nd editions. No trace of this site could be found during the field survey and it is possible that it was buried by the town midden (36). A findspot (33) comprising two pieces of medieval pottery, a possible lead bullet and a small piece of slag was identified during the field survey within a small erosion scar. The area to the northeast of boundary wall (1) is the site of the old town golf course (34). It is no longer officially in use but is know as 'Gleneagles' by the locals who still use it for practice.

5.8 Salt Pans

Buildings

5.8.1 Two buildings were noted eroding out of the dune section during the walkover survey. They are possibly the remains of the Salt Pans depicted on Farey's map (Farey 1812; Figure 2). One of these buildings (Site **4**) was subject to archaeological investigation in the previous phase of works, the plan of which can be seen on Figure 5. No further work was carried out on this site during the current phase of investigation.

5.8.2 Site 2 includes the remains of a possible building with an upstanding portion of wall and a flagged floor (Figure 6). The remains are currently eroding out of the dune section. The section was cleaned in order to define the remains. It was then drawn and photographed by the volunteers.

5.8.3 The wall (**202**) of the possible building consisted of two faces with a rubble core. Mortar (**203**) was visible between the stones and also on large tumbled stones lying on the beach. Large natural blocks of stone had been used in the construction of the wall. To the west of the wall a flagged floor was visible in the section. This consisted of large flat stones which had been laid down horizontally. Smaller stones found beneath the floor were perhaps used to level the stones (**206**). A thin layer of dark silty material (**205**) was recorded

lying on top of the flagged floor. No other features were visible at this location.

Midden

5.8.4 A large midden (**3**) was recorded lying to the west of the possible building (**2**) (Figure 7). It consisted of a building up of layers of industrial rubbish. A small section was cleaned and drawn in order to record the nature of this deposit.

5.8.5 The midden consisted of numerous layers, several of which are believed to be industrial in nature. A layer of 'dirty' natural sand (**316**) was recorded at the base of the midden. Above this was a layer of red and black industrial rubbish containing burnt coal, ash and shaley coal (**315**), measuring 0.32m thick. A sandy layer containing some flecks of shale and ash (**313**) was recorded above this. A layer of broken sandstone (**312**) was recorded lying above **313**, measuring c.0.04m thick. A distinctive red layer (**310**), possibly burnt coal, was recorded measuring 0.2m thick. This was followed by a pocket of sand (**309**) at the east side of the section which contains pieces of shaley coal and ash. Another pocket of sand (**308**) was recorded to the west of the section and although it is not directly linked to **309**, it is very similar. Above this a black layer (**305**) containing coal and ash, 0.02m thick was recorded. A layer of red and black material (**304**) containing ash, shale and burnt sandstone, 0.27m thick, was recorded lying above **305**. A layer of pale clay (**303**), 0.14m thick with no obvious inclusions was visible above **304**. A layer of burnt shale, coal and ash (**302**), 0.06m thick appears to comprise the top layer of the midden. This is followed by c.1.2m of sand (**301**) to the top of the dune.

5.8.6 There are several other layers within the midden which show different uses of this area. A sandy layer (**314**) near the base of the midden, possibly a wind blown deposit, appears to indicate a break in use of the midden. A layer of compacted grey/black clay (**307**) lying across the top of contexts **310**, **309** and **308**, measuring 0.1m thick, may be an old ground surface. It extends to the east of the section and continues along towards the possible building at Site **2**. Another break in the use of the site is indicated by sandy layer (**306**), 0.12m thick. A sandy layer (**311**) above **312,** measuring 0.2m thick, may represent another break in the use of this site.

5.8.7 The section through this midden suggests that it may be infilling a depression in the sand. It also suggests that this was not just an area for dumping waste as at least two old ground surfaces are visible. This midden shows the complex nature of this site, as seen in the numerous different layers visible in section.

5.9 Auger Survey

5.9.1 Three areas were subjected to an auger survey during the current phase of investigation. The aim of the augering was to obtain an indication of the nature of the deposits below ground without being too invasive. Augering was used to investigate the area between the 'Saltman's House' and the coast, and to determine whether the buildings visible in the dune section continued into

the dune complex. It was also used to assess the area of the old golf course to determine if there were industrial remains beneath the surface. The depths and nature of the deposits encountered were recorded and can be found in Appendix 8.

Saltman's House

5.9.2 Figure 8 depicts the grid system used whilst augering around the 'Saltman's House' (Site **19**). Augers were extracted at 1m intervals to begin with, then 2m intervals when this was found to be too time consuming. It indicates where stone, industrial midden and domestic midden were encountered. It shows that the middens visible in the coastal section directly to the south of the house continued at least up to the house. It also indicates that the midden may cover a larger area than that covered during the survey, as the full extents of the midden were not revealed. Stone was encountered along the wall of the Saltman's house and also along the projected line of the wall (Site **8**) which cuts across this area. Augers were taken at three points across this line in order to rule out natural stones which gave a more accurate picture of the line of the boundary wall. They were taken at 2m intervals along the projected line of the wall.

Salt Pans

5.9.3 An auger survey was carried out around the eroding building remains of sites **2** and **4** (Figure 5). Augers were also taken above the midden site **3** and in a small deflation on the north side of the large dune complex. The aim of these augers was to establish whether the buildings continued into the sand dune. Augers were extracted following the archaeological deposits visible in the dune section to determine their extent.

5.9.4 Augering around building **2** suggested that the building does continue into the dune. Stone was encountered at several points and was tentatively identified as the continuation of the wall. In fact there were only a few auger points that did not encounter stone (5, 11 and 12). The survey indicated the presence of a building at least c.4m by 3m.

5.9.5 The survey indicated that building **4** did not continue into the dune complex and it seemed to confirm that the remains represent the back wall of a building which has almost entirely eroded away. Midden deposits were uncovered behind the wall, though due to the nature of the dune it was not possible to follow the midden deposits further into it. It is assumed that these relate to the midden (Site **3**) which lies adjacent to the building (Site **4)**.

Golf Course

5.9.6 An extensive auger survey was carried out over the area of the old golf course (Figure 9). Three transects were augered to determine whether there were any industrial remains within this area. Augers were extracted at 20m intervals. Limited midden material and stone was encountered at several points (Line 1 A13, A14, A16 and A17; Line 2 A3, A12 and A13; Line 3 A10) though these

were all close to identified features. Generally, the survey confirmed that this area has been altered over time and if there were any industrial remains in this area they are likely to have been removed or destroyed.

5.10 Geomorphological setting and the problem of erosion

5.10.1 The beaches in East Sutherland are strongly influenced by their geomorphology, adjoining raised shorelines that were formed by higher post-glacial sea levels. At Brora, the beach is backed by distinct relict cliffs and fronted by a subdued hummock and dune topography. Cobbles, gravel and sand-grade sediments all occur on the beach, which forms a narrow fringe at the top of a wide rock platform. Sand and storm shingle ridges are frequently concentrated at the high water mark. Seaward, the gradient of the beach is estimated at 6º but the general slope of the inter-tidal zone is flatter and strongly influenced by the rock platform (Smith and Mather 1973). The general volume of sand contained within the beach is seasonally altered by storm frequency, but in general the beach within the survey area is poorly nourished owing to the wide expanse of inter tidal rock platform. Much of the coastal edge is retreating. Key survey points of reference for the erosion survey along the Back Beach shoreline are listed in Table 1.

5.10.2 The principal erosion mechanisms are considered to be three-fold. The first is loss of dune sediment at the base of the cliff due to direct wave impact during storm conditions. The second erosion factor is dune blow-out which is leading to loss of sediment as a result of deflation; cleft-formation resulting in slope failure was observed at several points along the low dune cliff. Thirdly, but nonetheless significant, is local visitor pressure. Several tracks were identified leading down from the upper slopes to the beach below. Such areas are prone to erosion as the fragile vegetation cover is affected by trampling. The areas of cliff where cultural material is exposed are the areas in which erosion is most severe. These areas contain very unstable cliffs where heavier material such as brick and tile is easily weathered out of the soft unconsolidated sections. Dune stability is occurring towards the southern end of the survey area. Here, dense marram vegetation is well established and is lending stability to the low dune.

5.10.3 Table 1 provides a summary of erosion survey data within the study area. The survey points are located on Figure 10 and supported by Figure 11.

Table 1 – Summary of Erosion Survey Data

Survey Point No.	NGR	Summary description	Erosion Class
1	NC 90502 03346	Low dune cliff (1.2m) with gradual slope. Undercut below turf-line and failing. MHWM (Mean High Water Mark) c. 4m. Coastal path immediately behind cliff edge.	Definitely Eroding
2	NC 90554 03332	Low dune cliff (1.5m). Vegetated slopes but failing. Slight berm at cliff base. MHWM c7m. Fallen concrete block in front of cliff. Coastal path behind.	Definitely Eroding
3	NC 90525 03321	Unvegetated low edge with a gradual slope down to the beach. Cliff lost due to erosion from track down onto the beach. Low cliff rises on the S side.	Definitely Eroding

		MHWM c.9m.	
4	NC 90513 03314	Cliff with c 45 angle. Boundary wall exposed in section with large sub-rounded and sub-angular boulders visible. Slope failure on N side. Vertical cliff below turf-line with recent collapse. MHWM 5m.	Definitely Eroding
5	NC 90493 03300	Low cliff with vertical face and failing slopes. MHWM 4m. On S start of higher cliff	Definitely Eroding
6	NC 90490 03291	Cliff rising to 4-5m. Exposed building wall is section. Subject to wave hammer at base where scouring is evident. MHWM 1m	Definitely Eroding
7	NC 90472 03280	Deflation feature on 7-8m high dune cliff. Not hollow but gradual 45 degree slope with vertical top. Industrial refuse from salt-pans exposed at the base of the slope. MHWM at the base. Highest point of the dune sequence.	Definitely Eroding
8	NC 90463 03267	High dune cliff, c. 5m high. Upper region is stable due to well established vegetation. The base has been eroded thus exposing industrial remains of the salt works. MHWM 1m.	Definitely Eroding
9	NC 90453 03263	Promontory formed due to cliff recession to the side of the salt work building remains. Clear evidence of erosion at the base of the cliff where building fabric is now exposed. MHWM is currently at the base of the cliff. An eroding track down to the beach is also present.	Definitely Eroding
10	NC 90421 03262	Gradual slope from cliff edge at 3m high. Slight erosion at the base where HWM is present. Well established vegetation imparting stability. Noticeable storm berm nourished with boulders of uniform size.	Stable
11	NC 90381 03263	Cliff, 4m high with vertical crest with slope failure. Gradual slope to base. Rabbit infestation. MHWM at the base of the slope. Boulder strewn storm berm present. This point marks the start of the exposed demolition deposits in the upper cliff.	Definitely Eroding
12	NC 90369 03255	Cliff, 3.5m high with vertical face at the top. Gradual slope to beach. Exposed demolition deposits continue through this section. MHWM at the base with a storm berm present.	Definitely Eroding
13	NC 90349 03247	Cliff 4m high with a 1m high vertical face. The whole of this section is deflating, MHWM at the base. Demolition deposits exposed throughout this section.	Definitely Eroding
14	NC 90328 03238	Cliff with 1m high cliff face at the top sloping to MHWM where storm berm is present. Deflation hollows present.	Definitely Eroding
15	NC 90314 03232	Vertical cliff, 4-5m high. No exposed demolition material. Sporadic hollows due to deflation. MHWM currently at the base of the cliff.	Definitely eroding
16	NC 90285 03222	Intermediate zone between Site 15 and well vegetated section to the S. Secondary stabilisation ongoing over previously failed cliff edge. Terrace formation rather than gradual slope 3.5m high. MHWM at the base of the cliff. Sand over boulders.	Definitely Eroding
17	NC 90255 03210	Low cliff. 1.5-2m high, well vegetated. MHWM, 1m with a storm berm at the base of the cliff.	Stable
18	NC 90221 03203	Low cliff 1m high. A concrete pipe cover is being	Stable

		eroded out of the cliff slightly. Storm berm at the base of the cliff. Well vegetated and generally stable hereafter.	

5.11 Ground Penetrating Radar (GPR)

5.11.1 A GPR survey was carried out over the sand dune complex and an area around the Saltman's House (site **19**; Figure 12). The results of the GPR survey can be found in Appendix 7. The following information on the GPR survey was supplied by Tomi Herronen.

Survey and processing

5.11.2 The survey was carried out using GSSI SIR-3000 central unit and 270 MHz ground coupled antenna. The system was carried and the antenna dragged by foot over the site. A tread was used to measure the lengths and synchronise scans.

5.11.3 The first area of investigation was on the dune close to the sea on Brora Back Beach, above sites 2-4. Two lines were measured along the coastal path and a grid of several GPR lines was measured on top of a dune. Three lines were measured across the area of the Saltman's House (site **19**).

5.11.4 The data was processed and interpreted using Road Doctor for Windows – software.

Results

5.11.5 The preliminary results appear to correspond with what could be seen on the surface and what was already known from other techniques such as augering.

6. THE FINDS

Sue Anderson

6.1 Introduction

6.1.1 Finds were collected from three sites, and quantities are listed in Appendix 5.

6.2 Pottery

6.2.1 Two sherds of pottery from a single vessel were collected from Site **33**. The sherds were from the rim and neck of a jug with a pulled lip. It was in a fine sandy orange micaceous fabric with patches of green glaze internally, and is likely to be a local East Coast Redware variant of 13th to 15th-century date.

6.3 Metalwork

6.3.1 An oval plano-convex moulded lead object with flashing still attached was collected during augering near Site **19**. The object may be a failed bullet casting from a two-piece mould.

6.4 Slag

6.4.1 A large fragment of ferrous ?smithing slag or furnace bottom with a large piece of limestone adhering to the base, was recovered from Site **26**. A small fragment of undiagnostic ferrous slag was collected from Site **33**. Both pieces were largely unabraded and may be modern.

7 DISCUSSION

7.1 General

7.1.1 The recent phase of investigation within this area has brought together the results from the previous phase of work and the desk-based work. It has provided a better understanding of this area in terms of its industrial heritage and has provided information on which to base future work.

7.2. Historical Research

7.2.1 The historical research has provided details on the history of the industrial activity on Brora Back Beach. It has shown that salt production in this area, with the use of salt pans, dates back to at least 1598. Such activity is strongly linked to coal production which would have been used as fuel for the pans. This link can be seen in the numerous coal pits recorded on cartographic sources and recorded during the recent phase of investigation. A vast amount of coal would have been needed for such activities and therefore the availability and quality of the coal played a key role in the success of such ventures. This relationship would have played a key role in the sporadic production of salt in this area and ultimately its downfall.

7.2.2 The historical background research provided a basis for the archaeological investigation. In particular, Farey's map proved to be an indispensable guide to the physical remains visible on the surface of the study area. Many of the features mapped by Farey were still visible on the ground including coal pits and trackways though whether or not they would be recognisable to Farey today is debatable. Of the thirty–six sites identified during the current investigation, at least nineteen are depicted on Farey's map.

7.3 Archaeological Fieldwork

7.3.1 Thirty-six sites of interest were identified and recorded during the current phase of investigation. Most of these were subjected to a rapid survey and many would warrant further investigation in the future. Many of the sites can be linked to the salt production in this area and they include ten coal pits, two trackways and a port. The coal pits would have provided the back bone to the salt production in the area. The trackways would have provided transport routes for taking the salt up from the beach. The port may also have been used to transport the salt, although the name 'Winter Port' suggests that it was not used all year round. The site of the later saltworks, dating to between 1814-1828, is located in the east of the study area though the exact location of it is unknown. Further investigation of this site would aim to determine the extent and content of this site as the last phase of salt production in this area.

7.3.2 The relationship between the sites identified by this current phase of activity is not clear. It is tempting to lump all of the sites with similar functions, e.g. the coal pits, together or try and relate all features to the eroding buildings on the beach. It may be that the separate coal pits relate to different phases of salt

production. Further historical and archaeological investigation would be required to confirm or refute this hypothesis.

7.4 Auger survey

7.4.1 The auger survey proved to be a useful tool in locating and identifying areas of potential archaeological interest. The survey over the golf course identified several areas of potential buried archaeological remains. The locations of these areas were visibly close to areas known to be of potential interest based on the historical background research. A more refined auger survey of this area in the future may determine more accurately the extent of potential buried remains. It may also be useful to carry out such a refined survey over the whole of the study area.

7.4.2 Site specific augering was also carried out and is discussed below.

*Saltman's House (Site **19**)*

7.4.3 The Saltman's House was identified on Farey's map. The building appears to relate to the salt production of the late 1700s. It would have been the home of the saltman. The building was quite small and would not necessarily have been a permanent place of abode. The auger survey carried out over this area demonstrated that there had been a build up of midden material around the house. An assessment of the quantity and type of material in this midden may help to establish whether this building was a permanent or temporary residence. An investigation of the building itself may also determine its use.

*Saltpans (Sites **2** and **4**)*

7.4.4 Sites **2** and **4** are probably the remains of saltpans recorded from historical and cartographic research. Whilst it was not possible to prove this theory during the current phase of investigation, the size of the walls remaining suggests a large building complex. It is possible that these buildings housed the salt pans themselves, although the state of erosion at these sites may prevent a conclusive answer from emerging. The auger survey over these two buildings has shown that if there are further remains of these buildings they are to be found within the large sand dune complex surrounding the sites. Stone was located during the auger survey around site **2** and interpreted as the continuation of the wall. Site **4**, however, appears to be almost entirely gone, with only the back of the building surviving as a long length of wall on the beach. Further work within this area may determine what remains beneath the sand. Site **2** is more promising in relation to further work, as the building itself is visible running into the sand dune, complete with a flagged floor therefore suggesting that more lies within.

7.5 Erosion assessment

7.5.1 The erosion assessment was carried out to establish the rate and extent of erosion along the coastline of the Back Beach. Generally, it found that erosion rates were high along this area which suggests that the coastal remains along

this area are at great risk from erosion. By monitoring the erosion, using the marker pegs inserted during the current phase of investigation, it will be possible to determine the rate of erosion and those areas that are worst effected, and take the necessary action. This may involve protecting the sites or carrying out further archaeological investigation to gather as much information as possible prior to the site disappearing altogether.

7.6 Importance of the evidence

7.6.1 The salt industry was of vital importance in Scottish trade and commercial enterprise in the 17th and 18th centuries. The large-scale industry around the Forth is well known, but it is clear from the work so far that Brora was also an important source of the product. The remains identified during this survey, alongside the documentary evidence, provide a rare opportunity to study the history of this industry using both its physical remains and contemporary descriptions. The archaeological remains, which are under threat from coastal erosion, will soon be lost if not preserved by record. Further work on these sites must be carried out soon if more is to be learnt about the industrial and social history of this coastline.

8 RECOMMENDATIONS

8.2 There are several areas which are recommended for further work, including those not touched on in this report:

- full excavation of the eroding building remains and midden (Sites **2**, **3** and **4**), within the sand dune complex to establish their extent and use;
- further historical research into the history of the Brora Back Beach extractive industries, adding to the data already collected;
- an excavation of The Saltman's House (Site **19**) and surrounding area to fully investigate the use of this building and establish if indeed it was a domestic dwelling. This would also include an investigation of the midden deposits;
- small scale excavation of the boundary wall (Sites **8** and **9**) depicted on Farey's map and tentatively located during the auger survey;
- an excavation of the possible kiln (Site **17**);
- test-pitting of the area around the pit (Site **29**);
- test-pitting to establish the possible location of the later salt works (Site **30**).

8.2 The aims of these recommendations would be to:

- produce a comprehensive and accurate report outlining the chronological history for the early coal and salt industries at Brora during the period 1529-1818;

- inform our understanding of the importance of these early industries at Brora within an overall picture of the national industrial heritage and allow comparisons to be made with other coastal sites;

- uncover new information on the many different aspects of these industries at Brora to provide a fuller understanding of the overall subject than has been previously achieved.

8.3 The above recommendations are proposed to help in the understanding of this area as a whole whilst specifically targeting those sites which are at immediate threat of erosion.

8.4 Future work based on these recommendations would also allow for further training of the volunteers and to build on the skills and techniques learnt during this current phase of activity.

9 REFERENCES

9.1 Bibliographic

Adam, R. J. 1972 *Sutherland Estate Management.* Edinburgh: Constable

Advertiser Newspaper, *Salt pans (16th century) exposed during high tides*, 5th February 1869, Inverness Reference Library

Aitken, J. 2004 *The Salt Pans on Brora Back Beach – Archaeological Survey* Unpublished report, The Clyne Heritage Society.

Bangor-Jones, M. 1995 *The Early Story of Brora Coal* in The Northern Times, Scottish Provincial Press Ltd.

Bentick, C. D. 1926 *Dornoch Cathedral and Parish*. Inverness

Campbell, H. F. 1920 *Caithness and Sutherland*. Cambridge University Press.

Farey, J. 1813 *Inverbrora Coal Workings: History of the working and searching for Coal in Sutherland prior to the year 1778*

Franck, 1638 in Polson, A. 1902 *Brora and Surrounding District*, pg. 16, Pefferside Press Ltd

Fraser, W. 1892 *The Book of Sutherland.*

Gordon, Sir R. 1813 *A Genealogical History of The Earldom of Sutherland from its origins to the year 1630: With a continuation to the year 1651, Published from the original manuscript*.

Hunter, T. M. c.1900 *Industrial History of Brora*.

Innes, C. 1529 *Ancient Sutherland Charter, quoted in the Origines Parochiales Scotiae*, part ii, p727, Bannatyne Club, Edinburgh

MacBain, A. 1922 *Place Names of the Highlands and Islands of Scotland.* Stirling.

Mackay, Rev. G. 1845 *The Parish of Clyne* in The New Statistical Account, Vol. 15, 149-164.

Maclennan, J. 1971 *When Brora Ceased to be a Burgh*.

MacLennan, F. 1983 *Lower Brora.*

Morrison, H. 1883 *Tourists' Guide to Sutherland and Caithness with Historical, Antiquarian and Angling Notes*.

Owen, J. S. 1995 *Coal Mining at Brora (1529-1974)*. Inverness Highland Libraries.

Ross, Rev. W. 1794 *the Parish of Clyne* in The Statistical Account of Scotland, Vol. 10, 298-306.

Smith, J.S. and Mather, A. S. 1973 *The Beaches of East Sutherland and Easter Ross*. The Countryside Commission for Scotland.

Townsend, B. 1988 *How the lure of oil ended coalmining in the North*, The Northern Times, Scottish Provincial Press Ltd.

Wilson, R. 1999 "A salty tale of Brora's industrial heritage", The Northern Times, Scottish Provincial Press Ltd.

Wood, A. 1976 "When Brora was all buzz – a history of energy and enterprise", Northern Times, Scottish Provincial Press Ltd.

Yeoman, P. (ed.) 1999 *The Salt and Coal Industries at St Monan's, Fife in the 18th & 19th Centuries*, Tayside and Fife Archaeological Committee Monograph Two.

9.2 Cartographic

Anon, 1811-13 *Plan of the Town and Harbour of Brora.*

Anon, 1815 *Part of Sketch of County of Sutherland.*

Anon, 1821 *Plan of Allotments in the Parish of Clyne* (Map I, key II).

Farey, J. 1812 *Mineral Map of the Coal Field at and near Brora in the County of Sutherland.*

Forbes, W. 1820 *Part of Sutherland-shire*.

Forbes, W. 1820 *Plan of Allotments in the Parish of Clyne*.

Hydrographic Office, 1845 *Admiralty Chart of the Sutherland Coastline*.

Moll, H. 1745 *The Shires of Sutherland and Caithness*.

Ordnance Survey 1872 *Sutherland.* 25 inch to 1 mile. sheet CVI.2.

Ordnance Survey 1906 *Sutherland.* 25 inch to 1 mile. sheet CVI.2.

Ordnance Survey 1963 County 6 inches to 1 mile. Sheet NC 90SW.

Ordnance Survey 1971 County 1:2500. Plan NC 9003-9103.

Suther, F. 1818 *Sutherland Estate Plan of Inverbrora Farm*.

Sutherland Estate Tutors c.1772 *Sutherland Estate Plan of Inverbrora*.

Taylor, G. and Skinner, A. 1776 *Scotland's First Road Atlas – The Road from Tain to Wick.*

Thompson, J. and Johnson, W. 1820 *Sutherland Shire*.

9.3 Aerial Photographs

Sortie	Frames	Date	Scale
106G/SCOT/UK114	4274-4277	23/05/46	1:10000
Fairey Surveys 7343/33	941-945	17/05/75	1:10000

APPENDIX 1 – Gazetteer of Sites within Area

ID	Site	NGR	Description
1	Field boundary	NC 90513 03313	A dry-stone dyke eroding out of a sandy bank onto the beach. This wall is marked on the current OS map, and runs to the top of the raised beach at NC 90426 03486. The visible erosion face of the wall shows that it is constructed from local sandstone, probably taken from the beach. It has two faces and a rubble infill. Tumble from the wall is visible on the sandy bank falling down onto the beach. The true height of the wall is not known, as only part of the wall is visible at the eroding edge of the coastline. The visible part of the wall is approximately 0.8m wide.
2	Building	NC 90479 03298	A part of a large stone and mortar wall, and flagstone floor eroding out of a sand dune. There are many large, roughly dressed building blocks on the beach in front of and below this eroding structure, some of which still have mortar attached. The wall has two faces with a rubble infill of lime and shell mortar, and there appears to be an interior wall of mortared stones smaller than the outer wall. It is aligned NW/SE. The floor is also eroding out of the sand dune and it appears to be made from flagstones, and is assumed to be the interior of the building. A dark deposit is visible on top of the floor. The floor abuts the interior wall of the building and a one-course foundation level is visible beneath the floor. It appears that the floor was laid on top of small pieces of sandstone, which were probably used to even out the underlying sandy surface.
3	Industrial Midden	NC 90464 03285 - NC 90455 03274	Layers of industrial waste eroding out of a sand dune. The layers are of uneven thickness and are made up of different materials. This probably indicates that industrial waste was dumped at different times and that some deposits were more substantial than others. The material consists of red coal ash, black shale coal, sand and shale coal, silt and sand, natural clay, burnt pieces of red sandstone and pieces of sandstone, probably chipped from larger masonry blocks. It is possible that the midden material was dumped into a pit or deflated area and it can be seen to abut the exterior wall of the building at Site 4. The visible erosion face of the midden is approximately 15m in length and approximately 1.2m in height. The inland extent of the midden is unknown as only the eroding face of the midden is visible. A possible old ground surface is visible in the section and extends from the midden in a NE direction towards the building remains at Site 2.
4	Building	NC 90455 03267	The remains of a wall of a large building eroding into the sea. The wall is aligned E/W with a doorway and doorjambs visible. From the evidence provided by the doorjambs, the exterior face of the wall is against the sand dune, suggesting that there is little remaining of the building. The highest remaining portion of the wall, standing 1.5m, is at the E end of the structure and mortar is visible on many of the masonry blocks. Scattered masonry blocks can also be seen on the beach in front of the wall, which is protected by a shingle and stone bank. No turn in the wall is visible and it can be followed for approximately 17m in length. The doorway is constructed from finely dressed sandstone blocks, possibly quarried from the disused Sputie Quarry, 1km along the coast to the SW. The remaining wall of the building was traced to over 30m, after the windblown sand was removed during investigations in 2004. A piece of lead was found contained within one of the door-jambs.

5	Midden	NC 90376 03258	This location marks the beginning of several distinct sections of midden exposed along the eroding sandy edge of the coastline. The midden's inland extent is not known and it appears as a dark coloured band running along the eroding face of the coastline. The lateral extent of the midden is obscured by fallen clumps of grassy bank and sand. The midden is composed of black ashy coal and stone rubble approximately 0.25m thick and occurs approximately 0.5m below the surface. It is possible that this section of midden is connected to another near-by section of midden at Site 6.
6	Midden	NC 90353 03258	This section of midden is characterised by discrete layers of material, including pieces of sandstone and mortar, broken and crushed pieces of orange brick and pan-tile, black pieces of shale coal and ash and a sandy soil layer. The midden is approximately 0.5m below the surface. It is possible that this midden is a continuation of the section of midden at Site 5.
7	Midden	NC 90356 03259 - NC 90329 03255	An extensive area of midden eroding out of the sandy edge of the coastline. The midden is approximately 0.7m below the surface. The sequence of layers includes a thick linear band of black ashy/shale coal below a layer of broken brick and pan-tiles. It appears that a considerable number of orange pan-tiles have been dumped, in some areas one on top of the other forming a layer of 5 or 6. This section also contains domestic waste material, including the bones from marine and domestic animals. Finds from this midden includes two glass bottle bases and a neck, possibly from a Porter bottle. Other finds include two pieces of worked flint and a sherd of sponge-ware pottery. The lateral extent of the midden is approximately 22m and it varies in thickness throughout the section. This midden may be related to the waste from the building at Site 19.
8	Wall	NC 90334 03248	The lower part of what appears to be a dry-stone wall eroding out of the sandy edge of the coastline. The stone of the wall occurs 0.1m below the surface. It is of double-skin construction with a small stone in-fill. The double skin is constructed from large blocks of roughly shaped sandstone and the fill consists of small rounded stones. Possible tools marks are visible on some of the sandstone blocks. Similar sandstone blocks can be seen on the beach below where they have probably tumbled from the erosion face. The visible portion of wall is 1.36m in length, 1.4m in width and 0.4m in height and is orientated NE/SW. This wall is depicted on a plan by John Farey in 1812. This site may be related to another section of possible wall at Site 9.
9	Wall	NC 90330 03244	Sandstone blocks eroding out of the sandy edge of the coastline may be part of the boundary wall at Site 8. The sandstone blocks are similar in appearance to Site 8, but no in-fill is visible eroding out of the section. This feature is 0.4m in height.
10	Port a' Gheamhraidh (Winter Port)	NC 90399 03227	This harbour takes the form of a sandy channel cut though the natural bedrock (Jurassic Sandstone) and an area on the beach cleared of rocks and boulders. Boats may have been pushed up onto the cleared beach area and moored there until the next high tide when the fishermen would return to sea. This harbour was in use prior to the use of Brora Harbour, which was constructed in 1815. It is probable that shipments of salt and coal were exported out of this harbour from the 16th to the 18th centuries. A plan by John Farey in 1812 depicts a salt-water cistern at each side of the cut channel and the name 'Pump Rock' may refer to a system of water conveyance to the salt pans at this location. There is a reference in Polson (1902) to blasting of the

			rocks overlying the coal near the location of the old salt pans. Polson states that "it now forms a very conspicuous reef on the shore at low water". It is possible that these events partially created or enhanced the harbour in the past.
11	Boundary Markers	NC 90211 03155 – NC 90205 03176	A coastal boundary consisting of a straight row of large boulders aligned N/S, extending from a point below high tide mark on the beach extending into the sea. This feature is marked on a plan by John Farey in 1812 and is annotated as the 'March Stones'. It is visible at low tide and marks the boundary between Inverbrora Farm and the Inverbrora Coal Works.
12	Trackway	NC 90045 03223 – NC 90164 03226	This trackway can be traced from the top of the raised beach, extending obliquely down its face into the Inverbrora Coal-Works. The trackway is less definite through the coal-works. Along the edge of the raised beach, a stone wall appears to line the upper side of the trackway. The trackway is cut into the slope of the raised beach and has some small stones visible on the grassy surface. The trackway is 3.5m wide and appears on John Farey's 1812 plan.
13	Stone Clearance Heap	NC 90202 03251	A large area of cleared stones, probably from a former area of cultivation on top of the raised beach. The stones are of similar size and quite small, approximately 0.1m by 0.2m. The site appears like a scree-slope just below the top of the raised beach. It is known from map evidence that a large field above the raised beach was cultivated as far back as c1770. The stretch of cultivated land area above raised beach was cut off from the larger field when the railway was built in 1871.
14	Coal Trial-Pit	NC 90200 03219	An oval depression marks the site of an old coal trial-pit. A spoil lip is present on the SE side of the depression. It is approximately 9m by 8m and 2m deep. It is completely covered in mossy grass and bracken. An animal track cuts through the N side of the depression, and the trackway, Site 12, passes it within 5m on its N side. This feature is very distinctive and is easily recognised when viewed from the top of the raised beach. An additional paper of unknown date inserted into a report by John Farey (1813) providing evidence of this later trial pit - "In May and June 1872 Joshua Hetherington a miner from Consett near Durham obtained from the Duke of Sutherland permission to sink a trial shaft in the links below Shean park near the 'March Stones' marked on Farey's map".
15	Coal-pit	NC 90230 03234	An oval depression marks the site of an old coal-pit, just to the east of a possible area of stone clearance at Site 13. This is depicted on Farey's 1812 plan. The trackway at Site 12 passes to the S side of the pit. It is covered in grass and bracken and no stones are visible. This feature is very distinctive and is also easily recognised when viewed from the top of the raised beach.
16	Coal-pit?	NC 90271 03268	A slight depression in the grassy links together with a small area of nettles may be an indication that a pit existed at this location in the past. At NC 90295 03251 there is a possible spoil lip evident and a slight depression on the grassy links.

17	Building - limekiln	NC 90307 03266	The remains of a small building, marked as an 'Old Limekiln' on Farey's 1812 plan. The structure is orientated E-W and appears to take the form of a three-sided building with an open east end. The open end may indicate an entrance into the building. The structure is approximately 4m in length, 3.5m wide and the walls stand 0.4m in height. It is covered in grass and motorbike tyre marks are visible on top of the S wall, exposing soil and stonework. A thick covering of bracken has colonised the N wall. It is possible that the trackway at Site 12 continues to this point and passes just outside the N wall of this structure. Two large boulders are located on the grass to the N of the building and approximately 1m from it.
18	Coal-pit	NC 90330 03272	A wide shallow depression marks the site of a coal-pit marked on a plan by John Farey in 1812 and annotated as being 12 yards deep. It is possible that the outer extremity (spoil lip) of the pit has been removed or eroded in certain places due to animal activity, subsequent fence erection and the building of later structures. A discrete area of nettles marks the centre of the pit depression.
19	Building (Saltman's House)	NC 90361 03276	Scant footings of a rectangular building marked as 'Ruins of Saltman's House' on a plan by John Farey in 1812. No entrance is evident and areas of wall are difficult to trace on the surface of the grassy links. Some stonework is clearly visible on the E and W gable ends, made more visible by the action of frequent motorbike riding in the area. It is possible that part of the S wall of the building was removed when a later boundary wall was built. John Farey depicts a wall cutting through the S wall of the Saltman's House on a plan dated 1812. The interior of the building is slightly lower than the surrounding exterior ground surface. This building is also at threat from animal activity.
20	Stone Clearance Heap	NC 90312 03313	A heap of small rounded stones, similar in appearance to another stone clearance heap at Site 13 may be field clearance from an area of previous cultivation on top of the raised beach called Shean Park. The stone heap lies in a large hollow part-way up the raised beach slope. A trackway at Site 23 leading to the bottom of the raised beach, passes to the N of the stone heap.
21	Coal-pit – 15 men killed	NC 90397 03371	A 15m-diameter depression marks the location of a coal-pit, marked on Farey's 1812 plan as 'Coal Pit where 15 Men were killed'. The pit depression is located at the base of the raised beach slope and the NW side of the pit joins the slope without any obvious break. An area of nettles marks the centre of the pit and there is substantial bracken growth around its NW side. Numerous molehills are present in and around the pit area. The pit is approximately 3m deep.
22	Dump – building rubble?	NC 90462 03336	A low discrete mound of possible building rubble located on the NW side of a large eroding sand dune. A few pieces of sandstone can be seen protruding from the thinly grass-covered sandy surface. A small patch of nettles is growing amongst the rubble. This possible dump of rubble measures approximately 4m in length, 3m wide and 0.4 m high. The stones are similar to those found in the other eroding wall structures – Sites 2 and 4. Another dump of stones was recorded at NC 90499 03329
23	Trackway	NC 90320 03328	A trackway that begins at the top of the raised beach, passes on the N side of a stone clearance heap at Site 20 and continues to the bottom of the raised beach. The surface is covered in grass and is defined by bracken on both sides. The trackway is depicted on a plan by John Farey dated 1812.

24	Aerial Base	NC 90489 03508	A concrete aerial base approximately 0.85m in length, 0.65m wide and 0.65m high. There are two other similar aerial bases at Sites 27 and 32. These bases relate to a network of aerials belonging to the former Radio Station at NC 909 034.
25	Embankment	NC 90475 03510 – NC 90493 03506	This feature appears as a grass-covered, linear embankment. It is approximately 24m long, 5m wide and 0.7m in height. It is orientated SE/NW and extends from about halfway down the slope of the raised beach onto the grassy links where it terminates abruptly. The top of the embankment is flat and its use is unknown. An area of dumped garden soil and waste is located on its NE side. An aerial base (Site 24) is lodged on top of the embankment. It is possible that the embankment is connected with the near-by Radio Station's network of aerials, which were dismantled in the late 1980s.
26	Coal-pit?	NC 90514 03503	An oval shaped, grass-covered earthwork with clinker/slag fused to pieces of sandstone, marked on Farey's 1812 plan as 'Coal pit 26 yards [deep]'. The exposed heap of clinker is located on the NW side of the earthwork structure and is approximately 1.5m in height. It is situated on the free-access golf course. A near-by golf tee is locally named 'The Rocky' and it appears that it takes its name from the clinker mound forming part of this site. This earthwork has been cut through by a track, which was enhanced several years ago by the Water Board. The remaining part of the feature measures approximately 11m by 7m. There is a story recalled by the mineral surveyor John Farey (1813) and local resident Rob Wilson, regarding a seam of coal in one of pits which caught fire and continued to burn for some weeks. It is possible that the burnt clinker found around the edge or lip of this site relates to this documented event. There is an 'Old Limekiln' and a 'Coal pit 26 yards' marked at this approximate location on this plan.
27	Aerial base	NC 90521 03447	A rectangular aerial base made up of small stones combined with a concrete mortar. There are two other Aerial bases similar in appearance to this one at Site 24 and Site 32. These bases probably relate to a network of aerials belonging to the former Radio Station at NC 909 034.
28	Coal-pit?	NC 90532 03532	An oval-like grass and bracken-covered mound with a slight ditch depression on its NW side. It is similar in appearance to the other coal-pits recorded on the links and seems to be cut through by a track, which was enhanced by the Water Board some years ago. A coal pit 30 yards deep is marked on a plan by John Farey in 1812.
29	Coal-pit	NC 90670 03697	An area of clearly defined pit depressions and other features, including a possible trackway and building. There appears to be at least three pit depressions in close proximity to each other and the possible trackway is to the NE of these depressions. Nettles and bracken are growing in two of the depressions. A large stone is visible in one of the depressions. The possible trackway extends beyond a fence at NC 90710 03714 and may connect to the Caa Brae on Market Street. The coal-pit is marked on the OS 1st and 2nd edition maps. It is also as marked on a plan by John Farey (1812) and another estate plan dating to around c1770.
30	Saltworks (1814-1828)	NC 90880 03583	An area of industrial ash middens and a circular pit depression marks the site of the post-1800 saltworks. The buildings are depicted on a town plan dated 1811-13 and are annotated as 'Salt Cellar', 'Salt Pans' and 'Cistern'. It is possible that part of the industrial complex was used for housing at a later date and this use of

			the site is corroborated by accounts from the local community. The site is to the SW of Market Street. The 1811-13 plan also shows that a small gauge tramway or railway was built from the salt pans to the harbour. It is possible that part of the salt pans still exist underground, e.g. cellars and foundations.
31	Coal-pit?	NC 90624 03389	A clear pit-like depression, measuring 6m by 5m. A possible spoil lip occurs on the S side of the pit. The S side is approximately 1m deep and the N side is shallower at 0.2m deep. The centre is filled with modern dumped material including sandy soil, brick and tile fragments and shells. Nettles have colonised the centre of the depression. A linear arrangement of three boulders is located about 5m to the NE of the depression. Rabbit holes are clearly visible on the pit depression. A coal pit is marked on a plan by John Farey in 1812 and is annotated as 'Coal Pit used in Qn. Elizabeth's reign'
32	Aerial base	NC 90558 03333	A rectangular aerial base measuring approximately 1.15m by 1.25m. The full dimensions are not known as the base has sunk into the loose sand on the beach. It is made up of small stones combined with a concrete mortar. There are two other Aerial bases similar in appearance to this one at Site 24 and Site 27. These bases probably relate to a network of aerials belonging to the former Radio Station at NC 909 034.
33	Findspot	NC 9047 0334	Several artefacts were recovered from an erosion scar. They include two pieces of medieval pottery, a possible lead bullet and a piece of slag.
34	Gleneagles' Golf Course	NC 907 035 centred	An informally laid out course on links land that formed part of the Inverbrora Coal Works. The course comprises six artificially made or built up raised tee platforms. This course pre-dates the other Brora Golf Course, which was established in the 1891 by James Braid. The course is still in use and there have been many changes to the layout over the years. The first green on this course is on one of the goal lines of 'Hampden' – an old public football ground in use over one hundred years ago.
35	Radio Station (former)	NC 908 035 centred	A complex of military style buildings surrounded by a high boundary fence marked on the current OS map. The Radio Station was built in 1939 as a Government Post Office (GPO) and finally closed in 1986. It was converted into a listening station at the start of the Second World War. It was built using local labour and bricks made at Brora. A complex of aerial masts were erected on the links land to the W of the station. The aerials were positioned on top of circular raised grass covered mounds, forming a complete circle of masts for receiving incoming signals. These mounds are clearly visible on aerial photographs. Other masts were also required and some of the concrete aerial bases can still be found at different locations on the Back Beach – see Sites 24, 27 and 32.
36	Midden – c1880-1939	NC908 035	An extensive area of village midden or refuse dump comprising ash and domestic waste. The Radio Station was built on top of part of the village midden in 1939. The waste from the village was taken by cart and deposited into a natural U-shaped hollow and was in use from the late nineteenth century. A recent exploration of the site uncovered a range of glass and earthenware bottles, as well as buttons, crockery from two local hotels that burnt down in the early 1900s and many more interesting items from Brora's past.

APPENDIX 2 - Context Register

No.	Description
201	Sand dune and turf
202	Stone wall
203	mortar
204	Flag floor
205	Dark grey-black compact silty layer overlying flag floor
206	Small stones beneath flag floor
301	Sand dune
302	Industrial midden layer
303	Layer of clay
304	Industrial midden layer
305	Industrial midden layer
306	Sandy layer
307	Possible previous surface layer
308	Sandy layer
309	(part 6) sandy layer
310	Industrial midden layer
311	Sandy layer
312	Layer of broken sand stone
313	Sandy layer with burnt material
314	Sandy layer
315	Red-black Industrial midden layer
316	Sandy layer at bottom of midden-natural?

APPENDIX 3 - Photographic Register – Colour Slide & Digital

Film 1

Shot	Description	Taken from	Conditions
1	Registration shot		Low sun
2-3	Stone wall-1	South east	Low sun
4-5	Wall-2	South east	Low sun
6-7	Industrial midden-3	South east	Low sun
8-9	Industrial midden-3	Wider shot SE	Low sun
10-11	Industrial building-4	South east	Low sun
12-13	Industrial building-4	Wider shot SE	Low sun
14-15	Midden layer-5	South east	Low sun
16-17	Demolition layer-6	Wide south east	Low sun
18-19	Demolition layer-6	Close up SE (SW align)	Low sun
20-21	Demolition layer-6	South(NE align)	Low sun
22-23	Demolition/burnt coal layer-7	South east	Low sun
24-25	Demolition/burnt coal layer-7	South west	Low sun
26-27	Demolition/burnt coal layer-7	South west	Low sun
28-29	Demolition/burnt coal layer-7	South west	Low sun
30-31	Wall layer-8	South west	Low sun
32-33	Wall layer-8	South east	Low sun
34-35	Wall layer-9	South east	Low sun
36	Wall layer-9	South west	Low sun

Film 2

Shot	Description	Taken from	Conditions
1-2	Wall?-9	South west	Sunny/windy
3-4	Pit-14	North west	Sunny/windy
5-6	Track way-12	West	Sunny/dull
7	Track way and wall-12	South	Sunny/dull
8-9	Track way	East	Sunny/dull
10-11	Cleared stones-13	South east	Sunny/dull
12-13	Pit-14	North east	Sunny/dull
14-15	Pit-15	East	Sunny/dull
16-17	Pit-16	South	Sunny/dull
18-19	Lime kiln-17	East	Sunny/dull
20-21	Pit-18	South west	Sunny/dull
22-23	Saltman's house-19	South east	Sunny/dull
24-25	Saltman's house-19	South west	Sunny/dull
26-27	Saltman's house and east gable end-20	West	Sunny/dull
28-29	Coal pit (15 men died)-21	South west	Sunny/dull
30-31	Coal pit (15 men died)-22	West	Sunny/dull
32-33	Pump building rubble-22	North	Sunny/dull
34-35	Pump building rubble-22	North(close up)	Sunny/dull

Film 3

Shot	Description	Taken from	Conditions
1	Registration shot		Windy/OC
2-3	Midden section	South east	Over cast
4-5	Midden section	South east(close up)	Over cast
6-17	Erosion face	Panorama SE	Over cast
18-19	Site	South east	Over cast
20-21	Close up of floor site	South east	Over cast
22-23	Extension to erosion face	South east	Over cast

Film 4

Shot	Description	Taken from	Conditions
1	Registration shot	----------	----------
2-3	Aerial base –24	South east	Sunny/dull
4-5	Embankment-25	East	Sunny/dull
6-7	Lime kiln-26	North	Sunny/dull
8-9	Lime kiln-26	East	Sunny/dull
10-11	Clinker mound-26	East(close up)	Sunny/dull
12-14	Coal pit-29	North east	Sunny/dull
15	Aerial base(digital camera)-27	South east	Sunny/dull

APPENDIX 4 - Field drawings register

Sheet No.	Drawing No.	Scale	Section/Plan	Description
1	1	1:10	Section	South east facing section of industrial site 3
2	2	1:100	Plan	Plan of auger survey-superseded by Drawing number 3
3	3	1:100	Plan	Plan of auger survey showing principle remains encountered
4	4	1:10	Section	South east facing wall eroding into beach site 2
5	5	1:50	Profile	Outline of industrial midden

APPENDIX 5 – Finds Register

Site	Pottery		Slag		Lead		Spotdate
	No.	Wt/g	No.	Wt/g	No.	Wt/g	
adj. 19					1	30	
26			1	942			Modern?
33	2	9	1	13			13th-15th c.
Total	2	9	2	955	1	30	

APPENDIX 6 – Marker Post Register

Post No.	NGR	Distance from edge (m)	Distance from fence (m)
1	NC 9020 0320	3.1	3.36
2	NC 9023 0321	2.8	5.27
3	NC 9030 0322	2.1	3.94
4	NC 9034 0323	1.3	4.9
5	NC 9039 0326	0.8	2.45
6	NC 9045 0327	4.72	13.6
7	NC 9047 0328	2.82	10.4
8	NC 9048 0330	3.9	5.1
9	NC 9050 0330	0.93	4.45
10	NC 9052 0332	2.3	0 (fence post)
11	NC 9054 0332	1.76	3.66
12	NC 9060 0333	1.5	0 (fence post)
13	NC 9066 0336	2.05	5.4
14	NC 9070 0336	1.5	3.82

APPENDIX 7 – Ground Penetrating Radar Results
Jacqueline Aitken

Line 1 - FILE 35
Distance: 0-224 metres
This linear GPR survey started at a point on the pathway opposite the gate near the eroding wall (Site 2) and continued to the stile at the far end of our area of interest. The results are shown on several graphs and seem to indicate different areas of interest that will require further investigation. The eroding wall (Site 2) does not seem to have been detected by this particular linear GPR survey. It may have been carried out outwith the area of archaeology in the sand dune. 10 different points of interest were detected.

Line 2 - FILE 36
Distance: 0-55 metres
This linear GPR survey started just before the eroding wall (Site 2) and continued to the end of our grid over the sand dune. It is interesting to note that points 1 and 2 are in the location of the eroding wall (Site 2) and may indicate more of the wall hidden in the sand dune. This theory was further substantiated by the positive boring results in this area. There are also some other interesting results to investigate.

Line 3 - FILE 50
Distance: 0-65 metres
This linear GPR survey passed over three sites in our survey area, including the lime kiln (Site 17), pit (Site 18) and Saltman's House (Site 19). It is possible that point 1 (three points on graph) is the lime Kiln (Site 17) and point 3 (three points on graph) is the Saltman's House (Site 19). There does seem to be a break in the bedrock around points 5 and 2 and this may indicate the pit (Site 18).

Line 4 - FILE 51
Distance: 0-13.5 metres
This linear GPR survey started at the coastal fence and continued in a linear fashion through the Saltman's House (Site 19). The Saltman's House may be indicated on the graph as a layer about halfway along it. There also seems to be another two interesting points of interest worth investigating further.

Line 5 - FILE 52
Distance: 0-17.5 metres
This linear GPR survey started at the coastal fence and continued in a linear fashion through a possible pit (Site 18). The pit depression may be visible on the graph but the results seem more difficult to understand in this instance.

Line 6 - FILE 53
Distance: 0-25 metres
This linear GPR survey started at the coastal fence and continued in a linear fashion through the limekiln (Site 17). It is possible that point 5 is the limekiln as it is in the right location on the graph. It is also interesting to note that point 1 may be part of the boundary wall marked on Farey's map or another part of a wall underground. This is an interesting area and there are interesting results to follow up in the next stage of investigation.

APPENDIX 8 – Auger Survey Results

Saltman's House (Site 19) Auger Survey Results

Bore no.	Total Depth (m)	Description
0,0	0.09	0-0.09m topsoil 0.09m stone
0,1	0.3	0-0.3m topsoil natural sand at 0.3m
0,2	0.3	0-0.3m topsoil natural sand at 0.3m
0,3	0.8	0-0.23m topsoil 0.23-0.35m midden material 0.35-0.8m sandy soil 0.8m natural sand
0,4	0.9	0-0.3m topsoil 0.3-0.35m midden 0.35-0.9m sandy soil 0.9m natural sand
0,5	0.74	0-0.24m topsoil 0.24-0.35m midden 0.35-0.64m sandy soil 0.64-0.74m black burnt deposit 0.74m natural sand
0,6	0.87	0-0.32m topsoil 0.32-0.45m midden 0.45-0.69m sandy soil 0.69-0.72m black burnt deposit 0.72-0.83m sand 0.83-0.87m midden 0.87 natural sand
0,7	0.78	0-0.32m topsoil 0.32-0.54m midden 0.54-0.76m sandy soil 0.76-0.78m sandy soil with bits of brick 0.78m natural sand
0,8	0.68	0-0.46m topsoil 0.46-0.68m midden with shells 0.68m natural sand
0,9	0.59	0-0.34m topsoil 0.34-0.43m midden with tile fragments 0.43-0.59m compact black midden with brick frags 0.59m natural sand
0,10	0.65	0-0.32m topsoil 0.32-0.65m midden with tile and lime frags. 0.65m natural sand
0,11	0.66	0-0.36m topsoil 0.36-0.66m red/brown midden 0.66m natural sand
0,12	0.76	0-0.34m topsoil 0.34-0.76m red/brown midden 0.76m natural sand
0,13	0.85	0-0.33m topsoil 0.33-0.85m black claggy midden with tile and lime 0.85m natural sand
0,14	0.62	0-0.28m topsoil 0.28m-0.51m black claggy midden with tile and lime 0.51-0.62m lighter midden with red brick and lime

		0.62m natural sand
0,15	0.5	0-0.4m topsoil 0.4-0.5m black claggy midden with tile and lime 0.5m natural sand
0,16	0.6	0-0.52m topsoil 0.52-0.57m sandy soil 0.57-0.6m dark sand flecked with shale 0.6m natural sand
0,17	0.3	0-0.3m topsoil 0.3m soily sand
0,17.5	0.6	0-0.3m topsoil 0.3-0.35m soily sandy 0.35-0.4m lime, shale and sand 0.4-0.54m red brick rubble 0.54-0.56m dark soily sand 0.56-0.6m limey sand 0.6m natural sand
1,0	0.79	0-0.14m topsoil 0.14-0.22m stone 0.22-0.5m domestic midden with shells 0.5-0.6m sandy midden 0.6-0.79m sand 0.79m stone
1,1	0.17	0-0.17m topsoil 0.17m stone
1,2	0.2	0-0.2m topsoil 0.2m stone
1,3	0.21	0-0.21 topsoil 0.21m natural sand
1,4	0.87	0-0.2m topsoil 0.2-0.3m dark midden with shells 0.3-0.44m shaley burnt material, red clay and shell 0.44-0.55m sand 0.55-0.84m claggy soil with burnt shale and shells 0.84m natural sand
1,5	0.85	0-0.17m topsoil 0.17-0.23m dark midden with shells 0.23-0.38m shaley burnt material, red clay and shell 0.38-0.51m sand 0.51-0.85m claggy soil with burnt shale and shells 0.85m natural sand
1,6	0.77	0-0.13m topsoil 0.13-0.21m dark midden with shells 0.21-0.36m shaley burnt material, red clay and shell (0.32m lead object) 0.36-0.5m sand 0.5-0.77m claggy soil with burnt shale and shells 0.77m natural sand
1,7	0.85	0-0.19m topsoil 0.19-0.61m dark midden with shells 0.61-0.85m sand 0.85m natural sand
1,8	0.63	0-0.22m topsoil 0.22-0.63m dark midden with shells 0.63m natural sand
1,9	0.61	0-0.33m topsoil 0.33-0.44m dark, burnt, compact shale layer 0.44-0.5m dark sand 0.5-0.61m dark midden with rubbles and shale

		0.61m natural sand
1,10	0.58	0-0.32m topsoil 0.32-0.37m sand 0.37-0.58m dark shale layer 0.58m natural sand
3,0	0.28	0-0.28m topsoil 0.28m stone
3,2	0.15	0-0.15m topsoil 0.15m stone
3,4	0.94	0-0.28m topsoil 0.28-0.59m midden with shale and shell 0.59-0.7m sandy midden 0.7-0.76m band of sand with charcoal 0.76-0.94m industrial midden 0.94m natural sand
3,6	0.79	0-0.28m topsoil 0.28-0.33m midden 0.33-0.6m industrial midden with clay and shale 0.6-0.73m dark sand 0.73-0.79m midden with shale 0.79m natural sand
3,8	0.6	0-0.46m topsoil 0.46-0.53m industrial midden 0.53-0.6m dark sand 0.6m natural sand
3,10	0.44	0-0.25m topsoil 0.25-0.34m industrial midden with burnt material 0.34-0.44m dark sand 0.44m natural sand
3,12	0.5	0-0.24m topsoil 0.24-0.35m dark sand 0.35-0.42m light sand 0.42-0.49m industrial midden 0.49m natural sand
3,14	0.51	0-0.27m topsoil 0.27-0.39m dark sand 0.39-0.51m industrial midden 0.51m natural sand
3,16	0.65	0-0.3m topsoil 0.3-0.36m dark sand 0.36-0.43m sand containing ash 0.43-0.53m industrial midden 0.53-0.65m sand 0.65m natural sand
3,18	0.45	0-0.37m topsoil 0.37-0.45m industrial midden 0.45-0.65m stone 0.65m natural sand
5,0	0.13	0-0.13m topsoil 0.13m stone
5,2	0.45	0-0.08m topsoil 0.08-0.45m midden with charcoal flecks 0.45m stone
5,4	0.17	0-0.17m topsoil 0.17m stone
5,6	0.52	0-0.2m topsoil 0.2-0.34m dark sand 0.34-0.39m sand 0.39-0.52m dark sand

		0.52m natural sand
5,8	0.62	0-0.3m topsoil 0.3-0.38m dark sand 0.38-0.59m industrial midden 0.59-0.62m sand with shells 0.62m natural sand
5,10	0.52	0-0.28m topsoil 0.28-0.38m sand 0.38-0.45m industrial midden 0.45-0.52m sand and shells 0.52m clean sand
5,12	0.44	0-0.23m topsoil 0.23-0.31m dark sand 0.31-0.36m light sand 0.36-0.44m dark sand 0.44m natural sand
5,14	0.61	0-0.3m topsoil 0.3-0.49m dark sand 0.49-0.58m sand 0.58-0.61m dark sand 0.61m natural sand
5,16	0.65	0-0.29m topsoil 0.29-0.42 dark sand 0.42-0.55m sand 0.55-0.65m dark brown soil 0.65m natural sand
5,18	0.32	0-0.32m topsoil 0.32-0.4m industrial midden 0.4m natural sand
7,0	0.26	0-0.26m topsoil 0.26m stone
7,2	0.53	0-0.18m topsoil 0.18-0.31m industrial midden 0.31-0.53m industrial midden with shells 0.53m stone
7,4	0.26	0-0.26m topsoil 0.26m stone
7,6	0.46	0-0.27m topsoil 0.27-0.39m dark sand 0.39-0.46m sand 0.46m natural sand
7,8	0.63	0-0.2m topsoil 0.2-0.32m dark sand 0.32-0.35m sand 0.35-0.43m clean sand 0.43-0.51m industrial midden 0.51-0.63m dark sand 0.63m natural sand
7,10	0.46	0-0.22m topsoil 0.22-0.25m light brown sand 0.25-0.39m sand 0.39-0.46m dark sand 0.46m natural sand
7,12	0.42	0-0.2m topsoil 0.2-0.42m dark sand 0.42m natural sand
7,14	0.55	0-0.3m topsoil 0.3-0.36m dark sand 0.36-0.55m sand with tile

		0.55m natural sand
7,16	0.62	0-0.35m topsoil 0.35-0.51m dark sand with sandstone frags. 0.51-0.62m sand 0.62m natural
7,18	0.43	0-0.36m topsoil 0.36-0.43m dark sand 0.43m natural sand
9,0	0.2	0-0.2m topsoil 0.2m stone
9,2	0.94	0-0.31m topsoil 0.31-0.5m sand 0.5-0.64m midden with shell 0.64-0.73m dark sand 0.73-0.94m lighter sand 0.94m natural sand
9,4	0.88	0-0.27m topsoil 0.27-0.49m dark sand 0.49-0.73m midden with shale and shell 0.73-0.88m dark sand 0.88m natural sand
9,6	0.25	0-0.25m topsoil 0.25m stone
9,8	0.65	0-0.27 topsoil 0.27-0.38m dark sand 0.38-0.45m midden 0.45-0.46m thin band of sand 0.46-0.58m midden 0.58-0.65m dark sand 0.65m natural sand
9,10	0.58	0-0.3m topsoil 0.3-0.44m sand 0.44-0.49m dark sand 0.49-0.58m sand 0.58m natural sand
9,12	0.46	0-0.22m topsoil 0.22-0.38m dark sand 0.38-0.46m dark sand containing flecks of charcoal 0.46m natural sand
9,14	0.58	0-0.28m topsoil 0.28-0.46m dark sand 0.46-0.52m sand 0.52-0.58 dark sand containing flecks of charcoal 0.58m natural sand
9,16	0.38	0-0.22m topsoil 0.22-0.38m dark gritty sand 0.38m possible stone/obstruction
9,18	0.51	0-0.41m topsoil 0.41-0.51m dark sand 0.51m natural sand
11,0	0.36	0-0.2m topsoil 0.2-0.36m midden 0.36m stone
11,2	0.55	0-0.32m topsoil 0.32-0.44m midden 0.44-0.54m shale 0.54-0.56m dark sand with shell and shale 0.56m natural sand
11,4	1.3	0-0.25m topsoil

		0.25-0.41m midden with shale and brick 0.41-0.47m light brown midden 0.47-0.71m domestic midden 0.71-0.8m ash midden 0.8-0.9m dark sand with clay 0.9-0.99m midden 0.99-1.3m dark sand 1.3m natural sand
11,6	0.86	0-0.23m topsoil 0.23-0.45m dark sand 0.45-0.58m shale and shell 0.58-0.67m dark sand 0.67-0.75m sand 0.75-0.86m dark sand 0.86m natural sand
11,8	0.74	0-0.25m topsoil 0.25-0.41m dark sand 0.41-0.72m midden 0.72-0.74m sand 0.74m natural sand
11,10	0.6	0-0.22m topsoil 0.22-0.43m dark sand 0.43-0.5m midden with brick/tile
11,12	0.53	0-0.29m topsoil 0.29-0.53m dark sand 0.53m natural sand
11,14	0.63	0-0.32m topsoil 0.32-0.53m dark sand 0.53-0.63m soil containing charcoal/coal 0.63m natural sand
11,16	0.70	0-0.28m topsoil 0.28-0.7m dark sand with tile frags and grit 0.7m natural sand
11,18	0.55	0-0.11 topsoil 0.11-0.36m dark sand 0.36-0.55m sand 0.55m natural sand

Golf Course Auger Survey Results

Line 1		
Auger No.	**Depth (m)**	**Comments**
1	0.36	Stone and gravel
2	1.45	Light sand
3	1.28	Orange sand
4	1.28	Orange sand
5	0.8	Orange sand
6	0.43	Orange sand
7	0.79	Orange sand
8	0.9	A few pebbles and 2 pieces shaley coal at 0.53m
9	0.9	Orange sand
10	0.75	Orange sand
11	0.83	Orange sand
12	0.58	Orange sand
13	0.16	Stone
14	0.4	Stone
15	0.15	Stone
16	0.5	Pebbles and orange sand

17	0.18	Stone
18	----------	----------
Line 2		
1	0.35	Topsoil containing shell on to orange sand
2	0.2	Topsoil containing shell and pebbles on to orange sand
3	0.15	Topsoil containing stone onto orange sand
4	0.4	Topsoil containing shell on to orange sand
5	0.2	Sand just under the topsoil
6	0.4	Topsoil onto orange sand
7	0.58	Topsoil containing shell on to orange sand
8	0.5	Topsoil containing shell on to orange sand
9	0.5	Topsoil containing shell on to orange sand
10	0.25	Sand just under topsoil, containing pebbles
11	0.15	Sandy soil under topsoil, containing pebbles
12	0.19	Topsoil and stones onto orange sand
13	0.18	Topsoil and stones onto orange sand
14	0.4	sand
15	0.32	Topsoil onto orange sand
Line 3		
1	0.42	Topsoil to natural sand
2	0.46	Topsoil to natural sand
3	0.45	Topsoil to natural sand
4	0.41	Topsoil to natural sand
5	0.35	Topsoil to natural sand
6	0.35	Topsoil to natural sand
7	0.18	Sand
8	0.4	Sand
9	0.24	Sand
10	0.8 +	Midden material

Dune Complex Auger results

Site 2		
Auger no.	**Depth (m)**	**Comment**
1	0.81	Stone encountered at this depth
2	1.28	Stone encountered at this depth
3	1.33	Dark silty layer encountered at this depth
4	1.18	Stone encountered at this depth
5	3.80	Stone encountered at this depth
6	1.51	Stone encountered at this depth
7	1.23	Stone encountered at this depth
8	2.16	Stone encountered at this depth
9	1.69	Dark silty layer encountered at this depth
10	1.98	Dark silty layer encountered at this depth
11	2.45	No archaeological deposits encountered
12	5.2	No archaeological deposits encountered
13	1.4	Stone encountered at this depth
14	1.37	Stone encountered at this depth
15	1.3	Black shale layer at 1.2m, stone encountered at 1.3m
Site 4		
1	1.4	Top of industrial midden encountered at this level
2	3.0	Dark shaley black layer encountered at this level
3	1.45	Sand containing pieces of shaley coal

Fig. 2 - Farey's Map of 1812

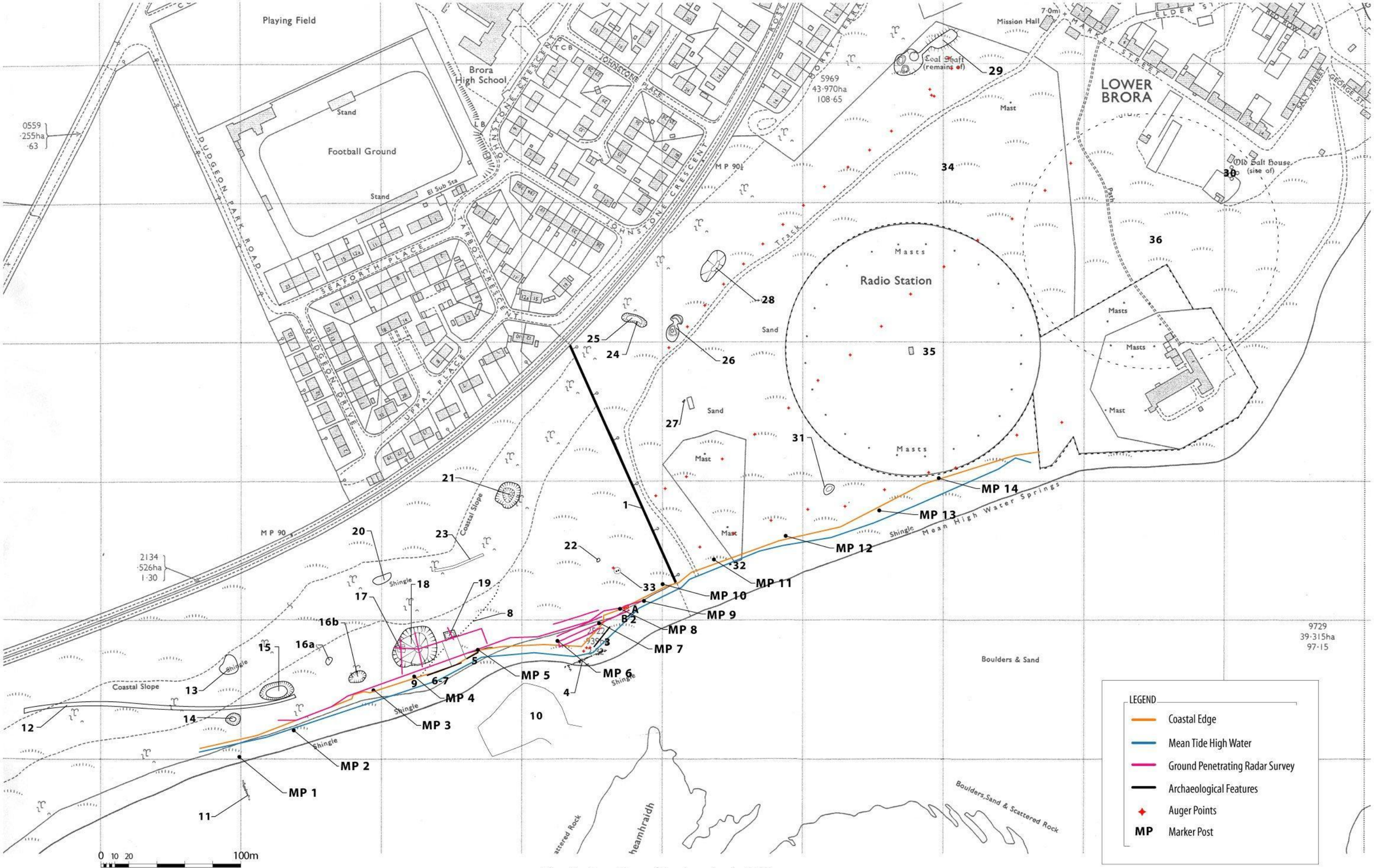


Fig. 3 - Location of Archaeological Sites

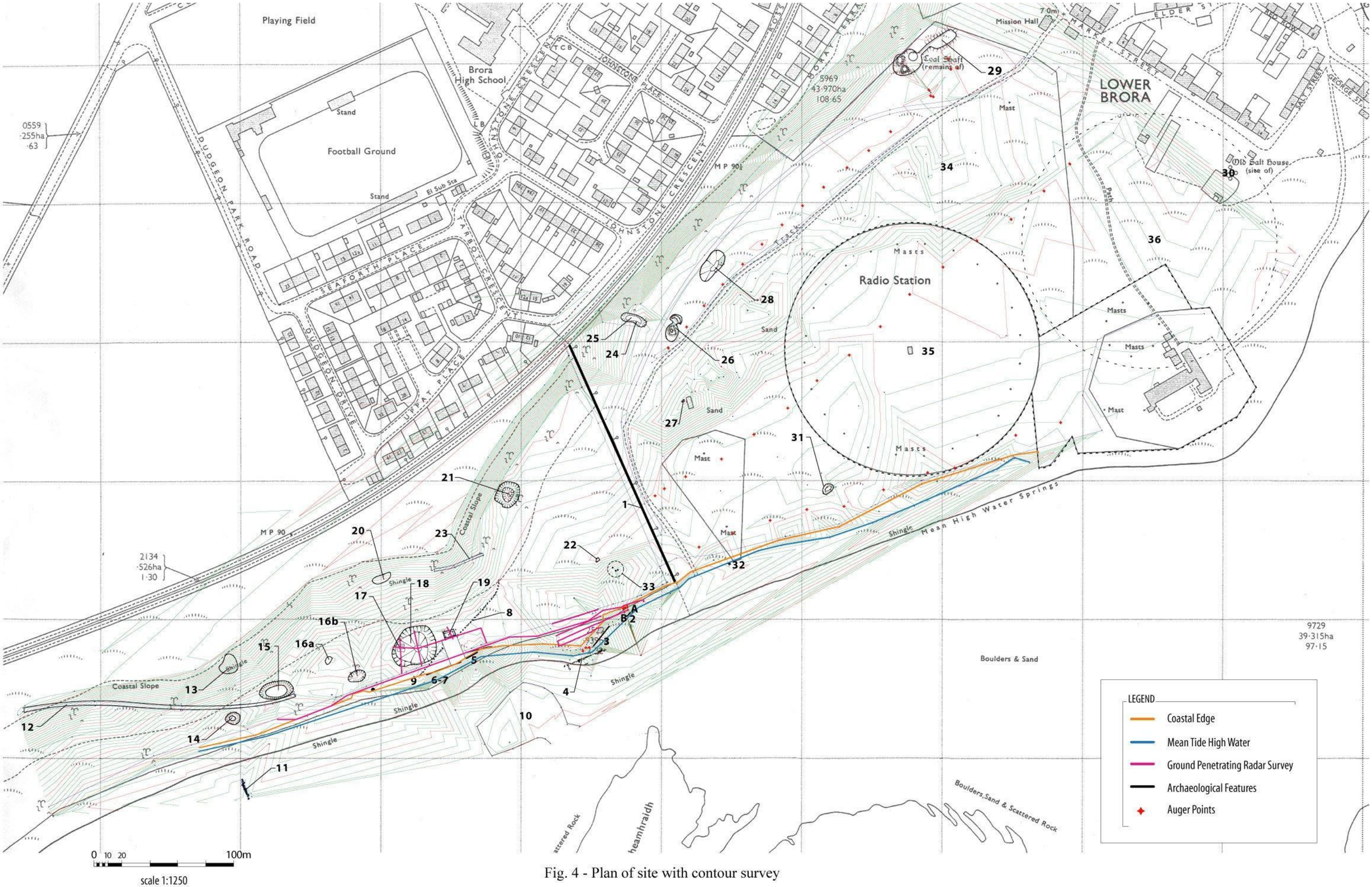


Fig. 4 - Plan of site with contour survey

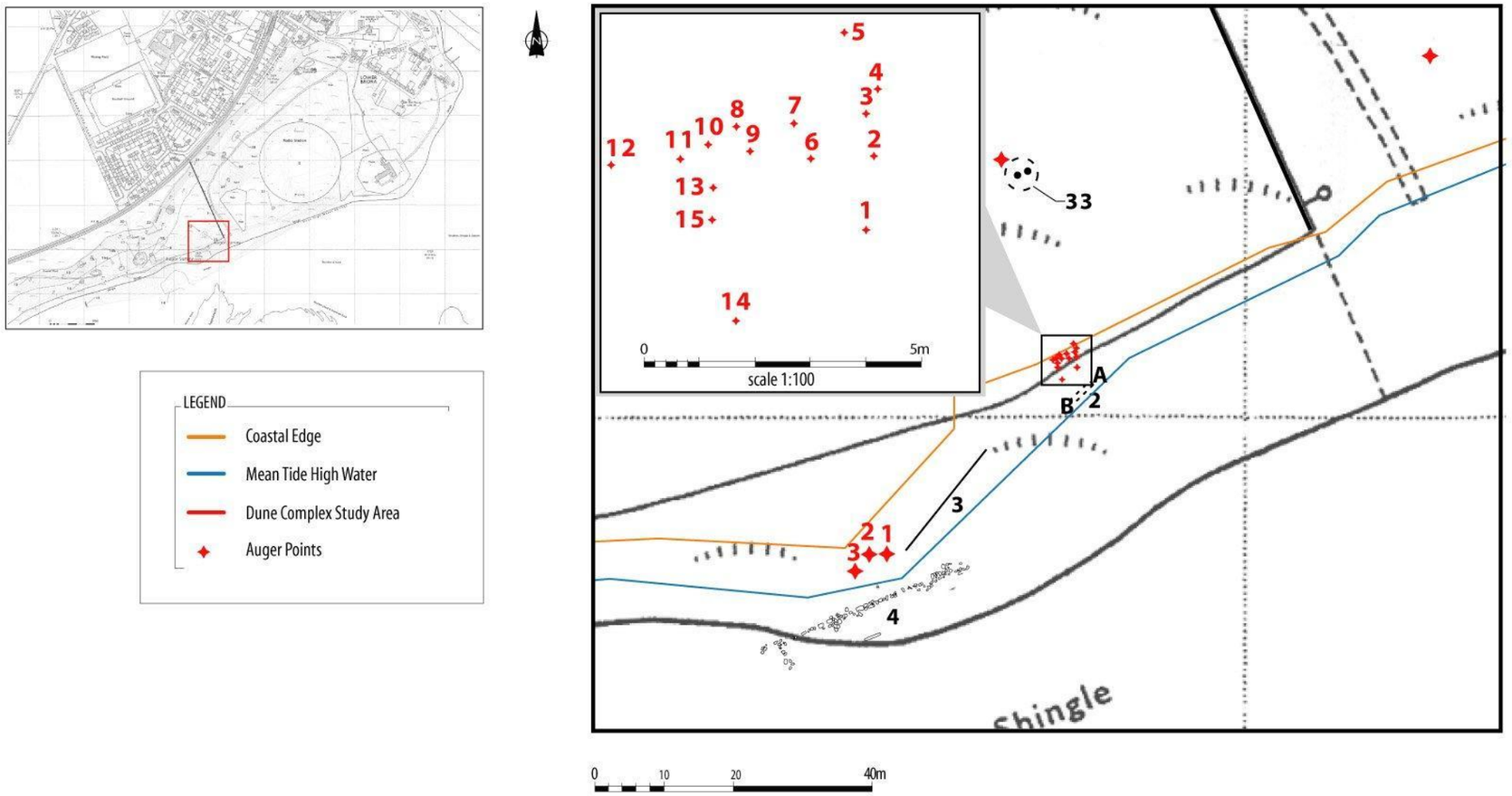


Fig. 5 - Plan of dune complex

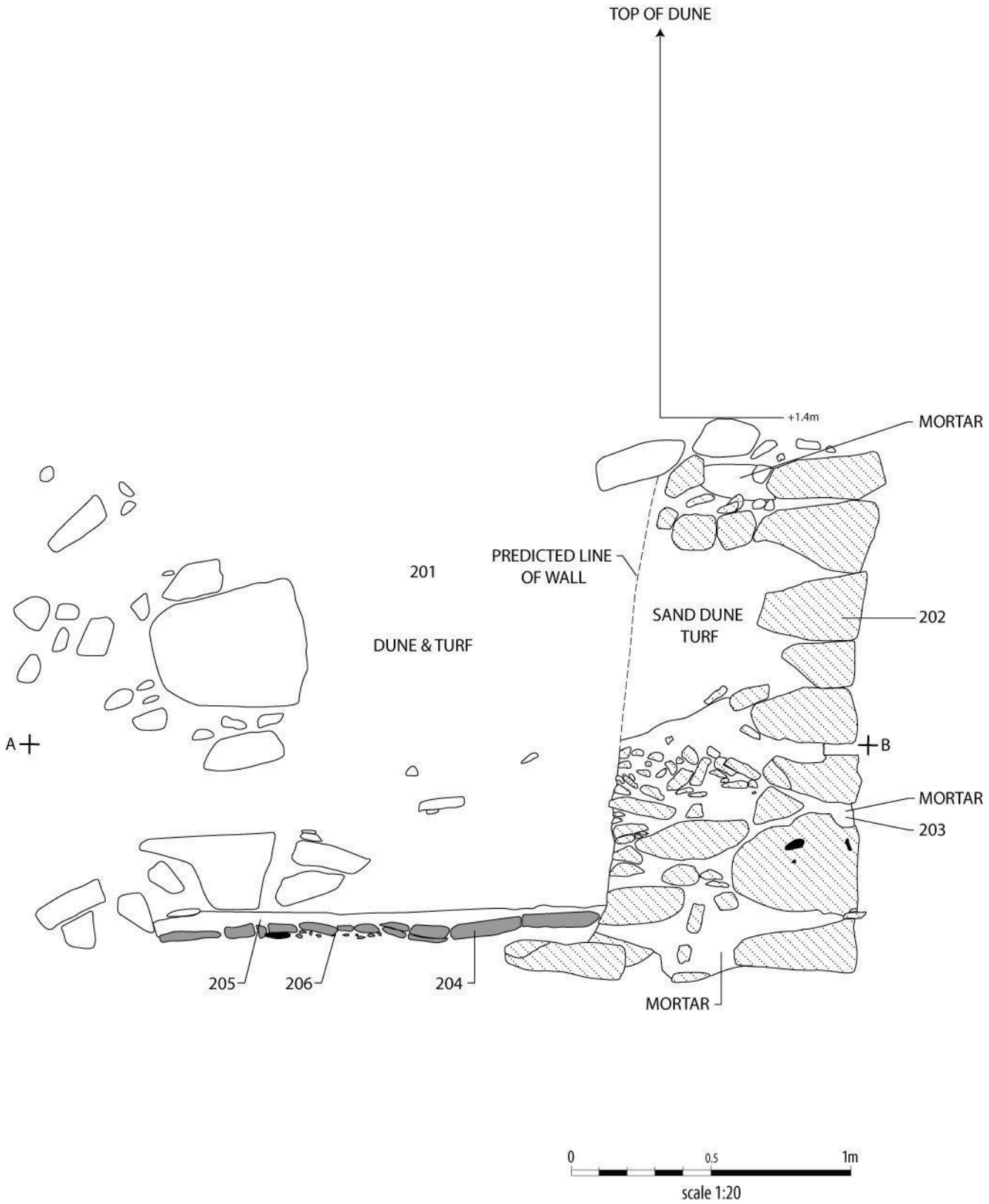


Fig. 6 - Section of building site 2 with flagged floor

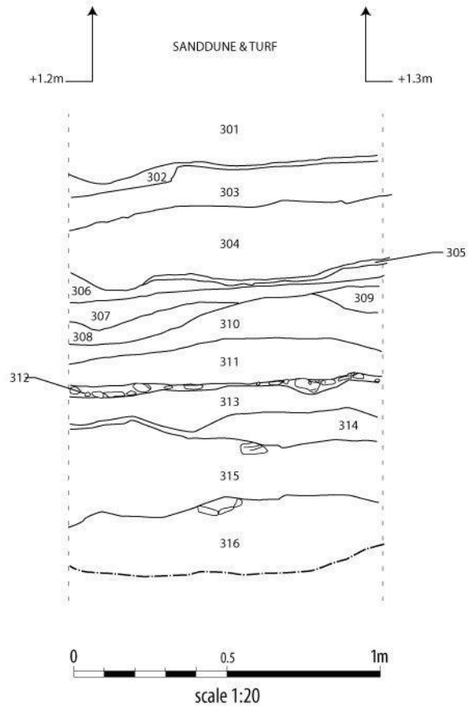
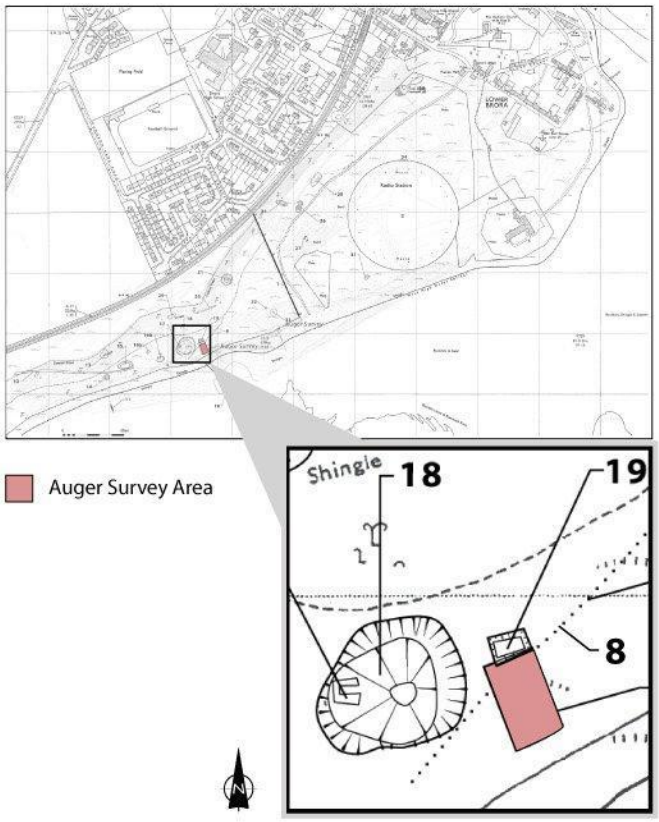


Fig. 7 - Photomontage and Section Site 3



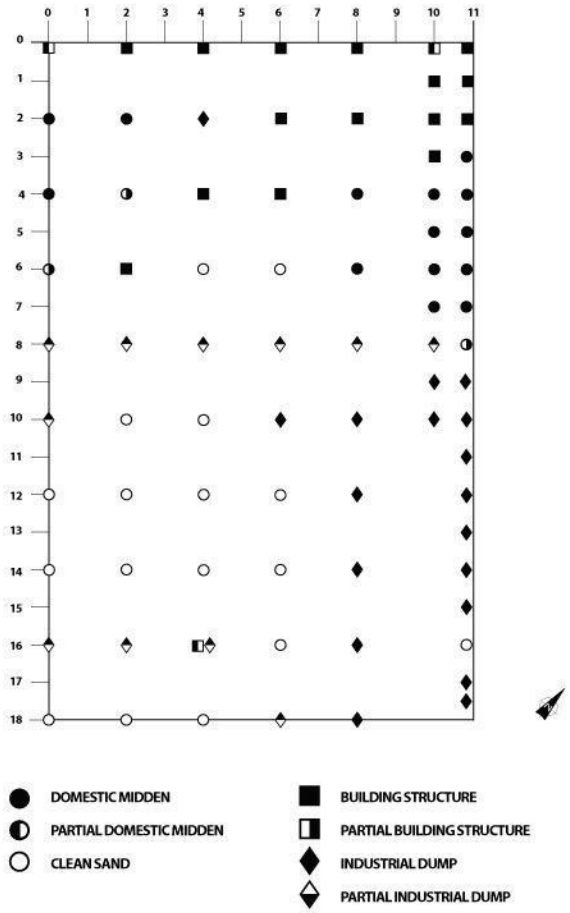


Fig. 8 - Auger Survey of Saltman's House Site 19

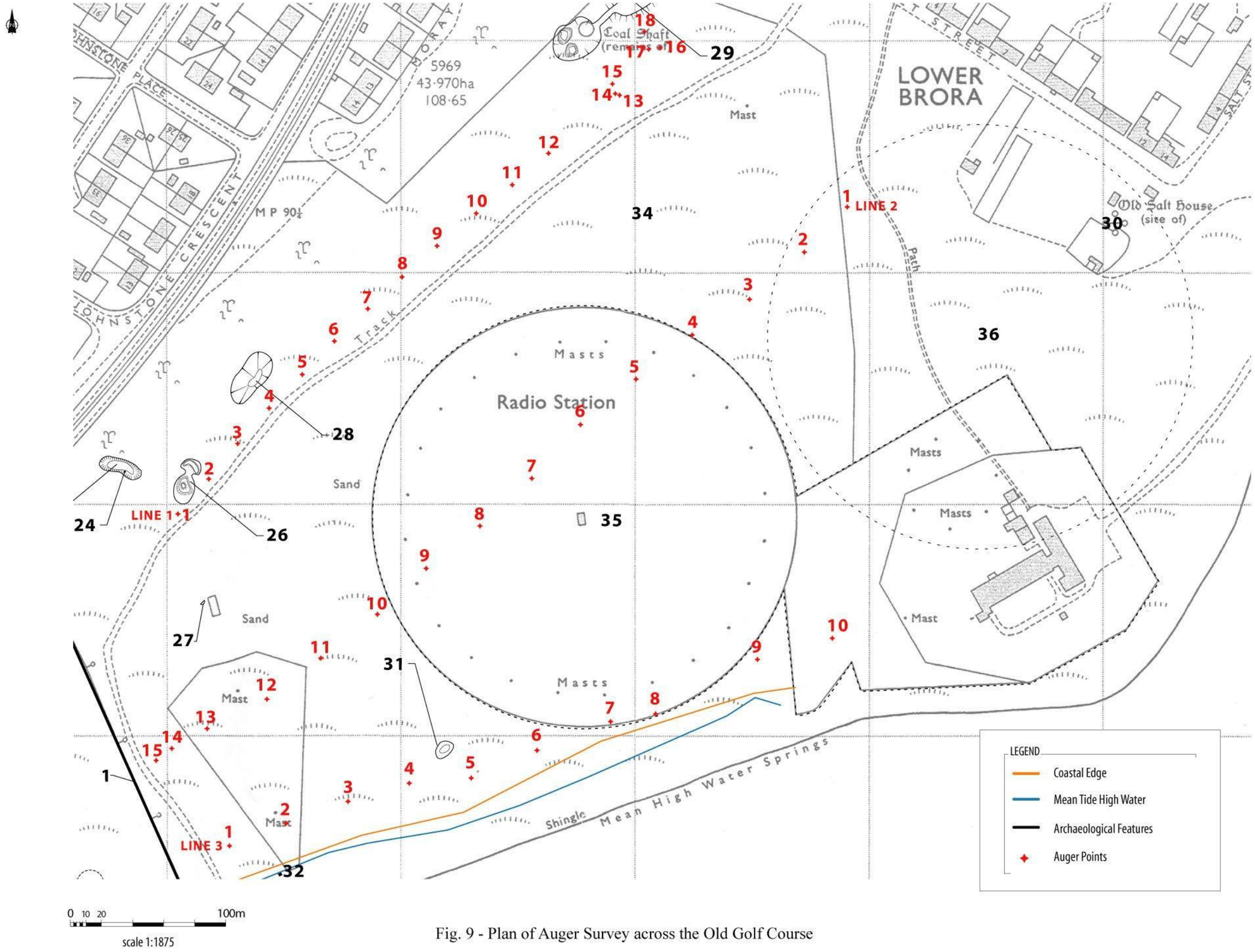


Fig. 9 - Plan of Auger Survey across the Old Golf Course

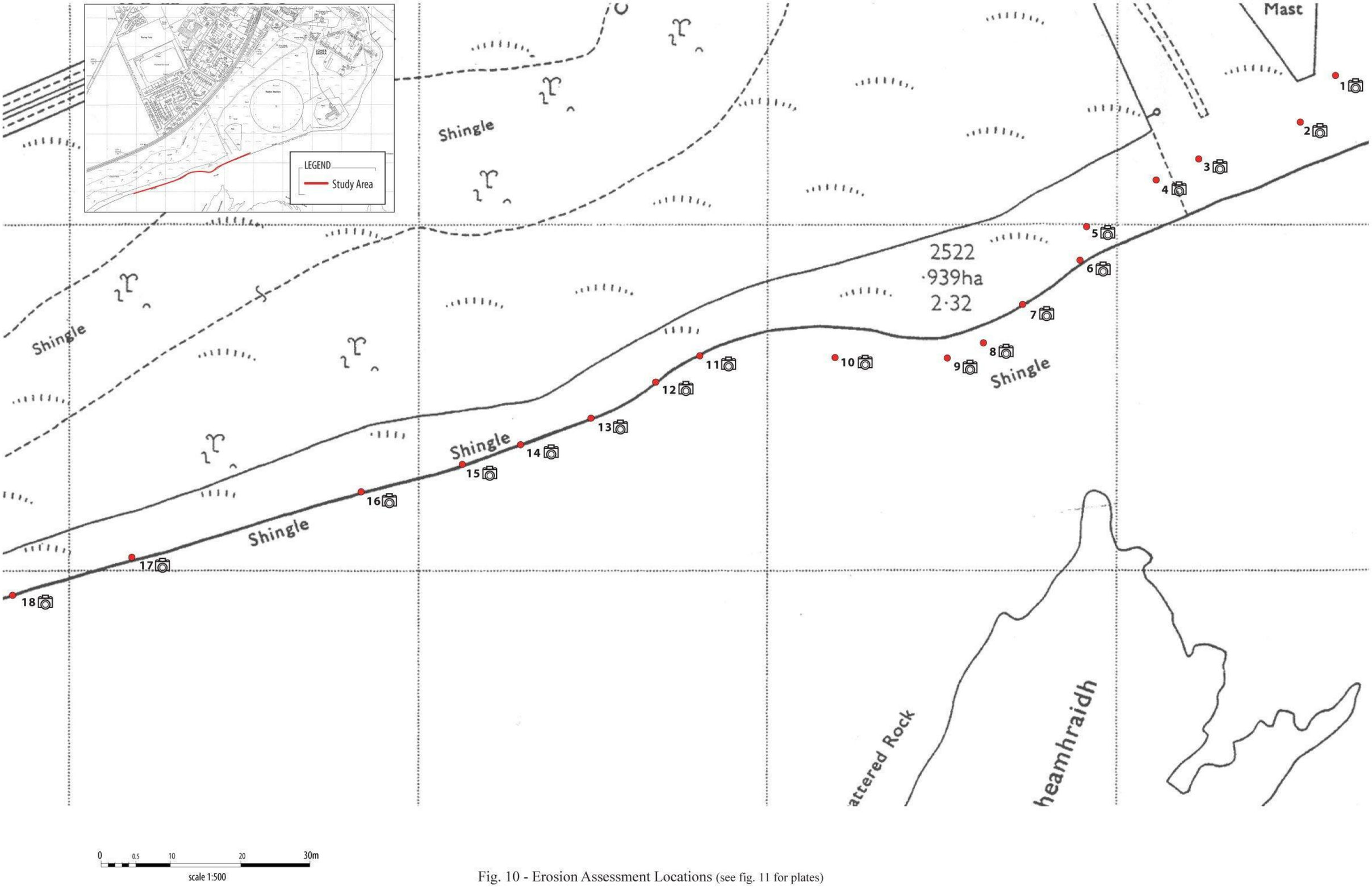


Fig. 10 - Erosion Assessment Locations (see fig. 11 for plates)

1 NC 90502 03346

2 NC 90554 03332

3 NC 90525 03321

4 NC 90513 03314

5 NC 90493 03300

6 NC 90490 03291

7 NC 90472 03280

8 NC 90463 03267

9 NC 90453 03263

10 NC 90421 03262

11 NC 90381 03263

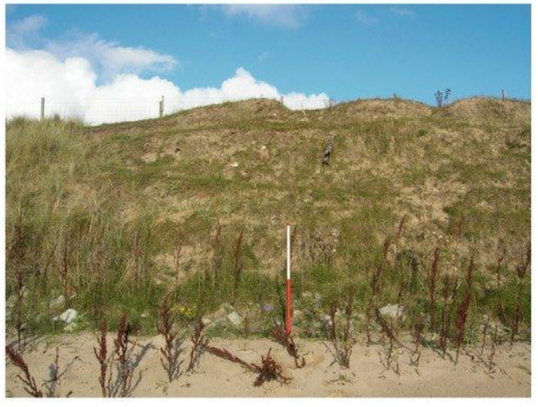
12 NC 90369 03255

Fig.11 - Erosion assessment photographs

13 NC 90349 03247

14 NC 90328 03238

15 NC 90314 03232

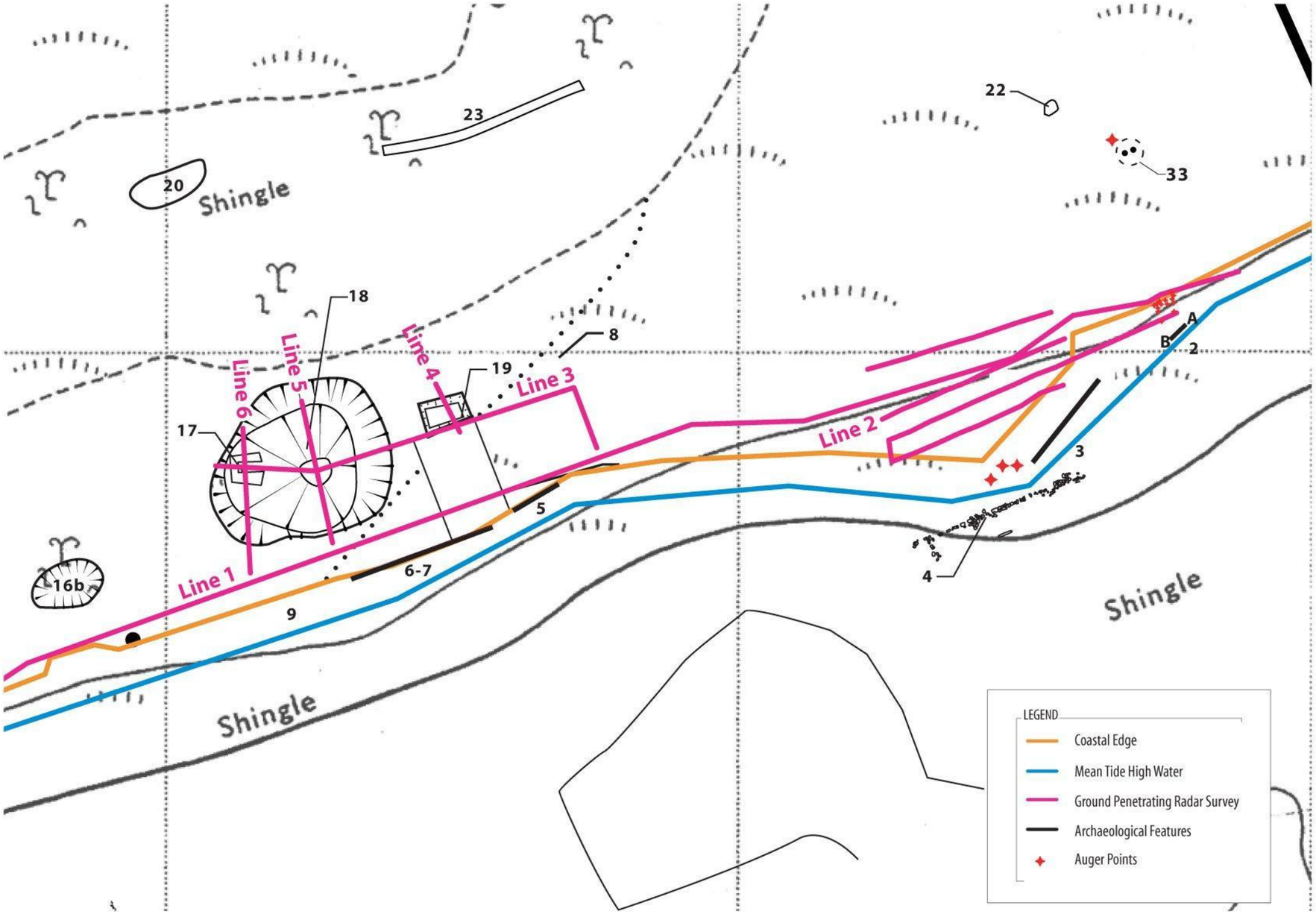


16 NC 90285 03222

17 NC 90255 03210

18 NC 90221 03203

Fig.11 - Continued



0 5m 10m 20m
scale 1:400

Fig. 12 - Location of Ground Penetrating Radar Survey

Plate 1.
Building 2 - 2003

Plate 2.
Building 2 - 2004

Plate 3.
Building 2 - 2005

Plate 4.
Building 4 - 1989

Plate 5.
Building 4 - Dec1999 - Jan2000

Plate 6.
Building 4 - April 2001

Plate 7.
Building 4 - 2003-2004

Plate 8.
Building 4 - 2003

Plate 9.
Building 4 - 2005

Plate 10.
Augering between the 'Saltman's House' and the Coast

Plate 11.
Augering over building site 2

Plate 12.
Coal pit site 21, with people lining the edge, taken in 2004

Plate 13.
Some of the volunteers from the current survey

Plate 14.
A section of the midden site 3

Plate 15.
Volunteers drawing the section of the midden site 3

Plate 16.
Site 1 - Boundary Wall

Plate 17.
Building site 2 during section recording

Plate 18.
Site 5 - Industrial Midden

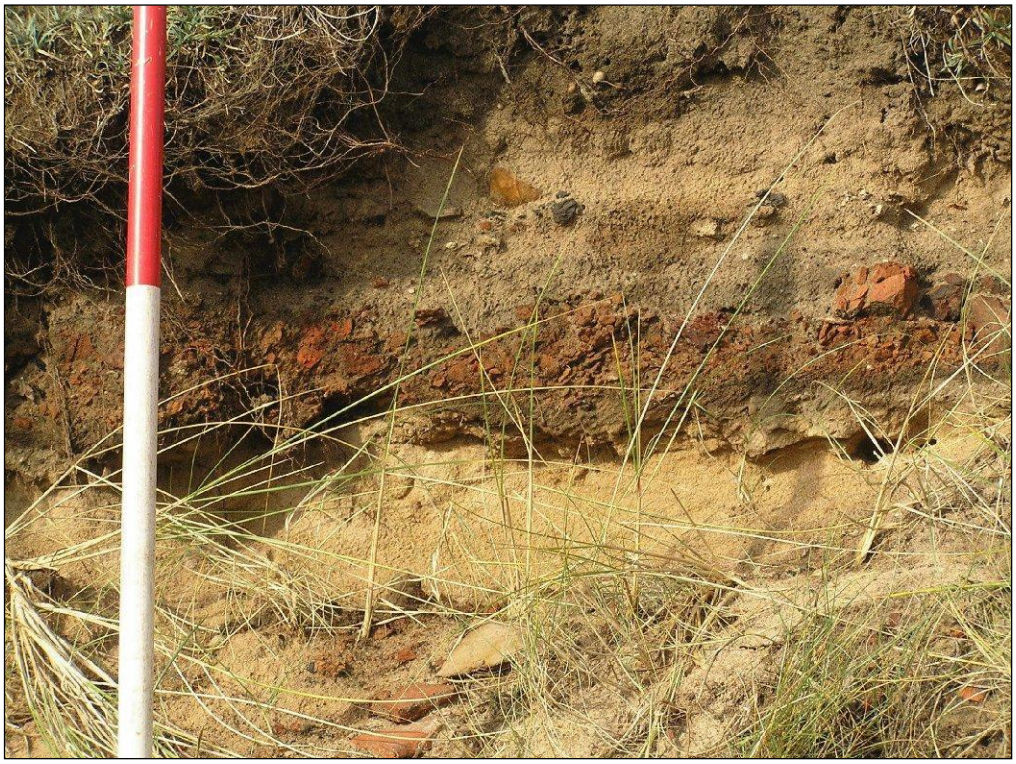


Plate 19.
Site 6 - Industiral Midden

Plate 20.
Site 7 midden containing domestic refuse

Plate 21.
Site 8 - Wall

Plate 22.
Site 9 - Possible wall

Plate 23.
Site 10 - Winter Port

Plate 24.
Site 12 - Trackway

Plate 25.
Site 14 - Possible Coal-pit

Plate 26.
Site 17 - Lime kiln

Plate 27.
Site 19 - The 'Saltman's House'

Plate 28.
Site 23 - Trackway

Plate 29.
Site 24 - Aerial base

Plate 30.
Site 25 - Embankment

Plate 31.
Site 26 mound containing clinker, slag and natural stone

Plate 32.
Site 26 - Possible limekiln

Plate 33.
Volunteers using the level