

Salt Pans, Brora Back Beach, Clyne, Sutherland

**A Report on the History of the Salt Pans
and
Summarised Survey Report - June 2004**

Clyne Heritage Society/Shorewatch



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(revised 2005)

The Salt Pans on Brora Back Beach

Archaeological Survey

June 2004

1. Introduction

In 1598, salt pans were established adjacent to the most northerly coal pits in Britain at Brora, on the east coast of Sutherland. 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 industrial buildings, which was marked on a mineral map by John Farey in 1813.

The author of this report has been monitoring two large structures constructed of dressed masonry blocks that have been eroding from the dunes for many years. Drawings and photographs donated by local residents graphically demonstrate the speed of their destruction. The buildings are in the position marked as the 'Old Salt-House' on Farey's plan, and are surrounded by residues related to salt working (GR: NC 90950 03564).

In 2004, members of Clyne Heritage Society began detailed recording of masonry on the beach. 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.



Figure 1 Aerial view of Brora Back Beach: the site of early coal and salt industries. The eroding features are on the beach in the centre of the picture. Photograph taken by Carl Majors, Brora

The author had earlier contacted Tom Dawson, a researcher from St. Andrews University and co-ordinator of a project called 'Shorewatch'. The aim of the project is to record Scotland's threatened coastal archaeology, i.e. along the entire 12,000km of its coastline.

The early history of salt production on Brora's Back Beach is lacking in documentary information, and there is an urgent need to fill in the gaps about this fascinating industry before the evidence is literally washed away! Many questions still surround the economic successes and failures of these

industries, e.g. Why Brora in 1598? What was the salt used for? Where did the skill and labour come from? Why were the industries short-lived? And what is left of them today?

Clyne Heritage Society organised a four-day surveying exercise at the site, in partnership with NOSAS (North of Scotland Archaeological Society).

2. Geological Overview of the Coastal Area to the South of Brora

The majority of the assignment area is devoid of rock outcrop, but economically rich rocks lie beneath the surface (as they do offshore) and excellent exposure occurs on the foreshore to the south of the mouth of the River Brora.

The oldest rocks in the immediate area are sandstones and shales 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 shallowly dipping to the east and the oldest rocks (the Brora Coal Formation) are exposed in the south west of the area. These rocks were deposited as sands and muds from a great Jurassic winding river in its flood plain stage, flowing into the already existing Moray Firth.

At the top of this formation, the Brora Coal seam (not now exposed) proved economically important in the history of the village and was deposited in a massive freshwater lagoon environment, close to the estuary of this large Jurassic river. It appears that after the coal was collected from the beach area, it was mined inshore, originally in 'bell pits', from 1529 and latterly in deeper adit shafts up until 1974. Indeed, the Brora Coalmine 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 42" (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.

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.

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 sea water 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.

Inland from the foreshore, 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. This is the phenomenon that occurs after an ice sheet (which has weighed down the land mass over thousands of years) melts, allowing the land to 'bounce' back to its former level, once the weight has been lifted. Another former cliff line and raised beach can be observed slightly further inland too. Both these features, traceable for much of the length of the Scottish coastline, 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 since then.

Resting on the upper raised beach and occurring randomly inland, are several hummocks of moraine. These are mounds of debris, which were formerly 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. Historical Background

First mention of coal at Brora

In 1529, a Sutherland Charter, quoted in the “Origines Parochiales Scotiae”, 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’”. It has been remarked by Malcolm Bangor-Jones that this statement does not necessarily mean that the coal was mined at this time and that local inhabitants probably carried out opencast quarrying of Brora coal as a domestic resource prior to this date. This Charter dated 1529 was deposited in the National Library of Scotland, along with other Sutherland Estate Papers.

Gordon family connection

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 that time salt pans were erected, but the venture was short lived and closed a few years later. These salt pans, filled with sea water, were fired with the locally won coal to evaporate, leaving a residue of salt. The purpose of this process was probably for the curing of salmon, which had been recorded in Loch Brora by Franck in 1658 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.



Lady Jean Gordon

Figure 2 Lady Jane Gordon, Countess of Sutherland, c1598

Sir Robert Gordon

At this point it is necessary to bring to your attention the only primary source of information compiled over thirty years after the salt and coal industries were initiated at Brora in 1598. It is in the form of a family book written by Sir Robert Gordon of Gordonstoun, Baronet, called ‘A Genealogical History of The Earldom of Sutherland from its origins to the year 1630: With a continuation to the year 1651’. Sir Robert Gordon was learned, far-travelled and involved in the politics of his day. The following extracts provide the first written evidence of salt production on Brora Back Beach.

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.”

This extract provides evidence that Sir Robert Gordon actually 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 near-by 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.

Extract 2

“... This yeir of God, 1598, the cole-heugh was found besyd Broray, and some salt pans were erected a little by-west the entire of that river, by Jane (or Jean), Countess of Southerland, unto whom her sone Erle John had committed the government of his affairs during his absence in France. There was good salt maid then at Broray, which served not onlie Southerland, and the neighbouring provinces, but also was transported into Ingland and elsewhere.... The coal-heugh was first found by John the fifth of that name, Erle of Sutherland, bot he being taken away and prevented by sudden death, had no leisure nor time to interpryse that work”.

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 earl 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 that, Lady Jane Gordon is first credited with the honour of first working the coal and establishing salt pans at Brora.

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

A time of Progress

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 Gordon's 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.

Burgh of Inver-broray

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.

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).

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 advises 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 and the seat of justice in 1631.

This does not mean that Brora did not still continue with some of its burgh duties bestowed on it at an earlier date. 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.

The author can find no evidence to suggest that Brora had 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 today.

Seat of power

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 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 doesn't seem too impossible that they had acquired the necessary skills and experience in trade and industry to commence these Brora industries.

It is now much clearer to understand 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.

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.

1614 salt pans

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.

Extract from the book 'Mary's Ladies'

"Fishing was an important part of the northern economy and a considerable element in the estate revenues. The salmon from Brora and Helmsdale were sold to merchants from Inverness, Elgin or Aberdeen, who sent their servants over to conduct the purchases. In 1616 the Edinburgh merchant, Alexander Watson, was in London with a hired ship selling Brora salt on behalf of her son, the 12th Earl, but 2 years later a reference to £666-13s 4d got from the sale of the iron of the saltpannis of Broray' suggests either that the scale of operations had been reduced or had come to an end altogether."

End of Brora's early salt production

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. Another major blow would have been the death of the earl in 1615, when the running of the estate fell into the hands to his brother Sir Robert Gordon.

Eighteenth century salt production

About 1764, the working of the coal was undertaken by John Williams, the author of the well-known book "The history of the Mineral Kingdom", 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 heaps to air and moisture; it was liable to go on 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.

Also at that 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 1813. 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 mentions the discontinuation of salt production at this period in the Old Statistical Account (1791-1799), and states, "*It is to be wished that it were renewed with greater vigour*".

Nineteenth century salt production

The last attempt to make salt (nearer the harbour) was undertaken by the Marquis of Sutherland in 1812. He invested £16,000 in the 4 pans and the construction of a miniature railway from the coal mine to the harbour and to the salt-pans. 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 be driven off as steam to consistently produce this amount of salt are barely imaginable, being 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 reopen.

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.

Dep 313-996 – Inventory of Saltern May 1822

Inventory & Valuation of Articles belonging to the Brora Saltworks
15 May 1822

3 Brora Saltworks			
3	old Salt rakes 6 ^d ea	-	1 6
2	D ^o ashes rakes	-	5 -
12	Salt Boxes @ 6/-	3	12 -
2	handles for D ^o	-	2 6
3	old Shovels	-	5 -
20	Salt bags	4	10 -
1	Ashes Box	-	12 -
1	Lime Riddle	-	2 -
4	Packers 12/-ea	2	8 -
1	Pair Bellows	3	- -
1	Study or anvil	1	10 -
8	hammers	2	2 -
1	Axe	-	2 -
6	Pr Smithy Tongs	-	10 -
5	Picks	-	15 -
1	vice or	1	- -
3	blood Casks	-	8 -
	weighing beam barrel & weights	2	- -
28	pair plates	5	12 -
1	horse & harness	1	10 -
		£24	5 -
	5000 Bushels of Salt on hand @ 1/6	375	- -
		£399	5 -
		48	2 -
		3	6 6
		£450	13 6

Gaps in the historical picture

Sadly, 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 go and 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.

4. Map Evidence

Maps have become more widely available to local researchers now that many collections appear on the internet, e.g. SCRAN (including Roy's Military Survey) and the National Library of Scotland's (NLS) website. These sources of map information, as well as other maps and estate plans, have been used to assist research into the history of the salt and coal industries at Brora. This research was undertaken to determine the location of three different salt pans, i.e. 1598, 1614 & 1768, and also to establish if any buildings are depicted by size and shape, as well as place-name evidence.

A list of all the maps that had a name or showed a structure relating to the early salt and coal works were consulted and a table of the results were compiled.

Maps arranged chronologically

Map Title	Surveyor	Date/ Imprint	Buildings, Place-Name and Annotation Evidence
The Shires of Sutherland and Caithness	Moll, Herman	1745	<i>"here are Mines of excellent Coal and Salt Pans"</i>
Sutherland Estate Plan of Inverbrora	Sutherland Estate Tutors	c1772	One large rectangular building, three other buildings and name ' <i>Salt Pans</i> '. Old Pit and New Pit.
Scotland's First Road Atlas – The Road from Tain to Wick	Taylor, George and Andrew Skinner,	1776	One large building on the coast, two other buildings and name ' <i>Salt Pans</i> '
Plan of the Town and Harbour of Brora	(Not known)	1811-13	100ft long building called ' <i>Salt Pans</i> ', ' <i>Salt Cellar</i> ' building and ' <i>Cistern</i> ' (1812-1828). ' <i>Colliers Houses</i> ' at Rosslyn Street
Mineral Map of the Coal Field at and near Brora in the County of Sutherland	Farey, John (Mineral Surveyor)	1812	' <i>Old Salt House</i> ' and ' <i>New Salt House</i> ' depicted as black shaded area on the coast. ' <i>Ruins of Salt Man's House</i> ', coal pits and limekilns. (Very detailed)
Part of Sketch of County of Sutherland	(Anon)	1815	' <i>Salt Pans</i> '. Key – 50 Coal Work Farm (Marquis of Stafford)
Sutherland Estate Plan of Inverbrora Farm	Francis Suther (Factor)	1818	' <i>Brora Colliery</i> ' at Fascally.
Part of Sutherland-shire	Forbes, William	1820	' <i>Brora Colliery</i> ' at Fascally.
Plan of Allotments in the Parish of Clyne	Forbes, William	1820	Two long buildings, two circular structures (cisterns?) depicted on plan. Also the word ' <i>Pipes</i> '. (1812)
Plan of Allotments in the Parish of Clyne (Map I, key II)	Unknown	1821	A building separated into four clear sections and another longer building split into three sections, as well as the name ' <i>salt pans</i> '. Also a short pipeline feature leading from one of the buildings to the sea. (1812)
Sutherland Shire	Thompson, John and Johnson, William	1820	Possible building location and name ' <i>Saltworks</i> '
Admiralty Chart of the Sutherland Coastline	(Not known)	1845	' <i>Inver-Brora</i> ' place-name by river estuary.

Note: Salt pans not depicted on OS 1st and 2nd Edition Maps.

The earliest evidence is from a map by ‘Moll’ dated 1745 of Sutherland and Caithness, which states, “*here are Mines of excellent Coal and Salt Pans*”. This statement probably referred to previous mining activities that had taken place during the first half of the eighteenth century. It is possible that salt was produced during this period as suggested by Moll’s map. The next period of mining activity was initiated by William, Earl of Sutherland, in 1747 when he returned to Sutherland.

Two maps depict buildings at the site of the old salt pans on the Brora Back Beach foreshore. The map by Taylor and Skinner dated 1776 (Scotland’s First Road Atlas) states the name ‘*Salt Pans*’, but it 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 the substantial wall remains located on the beach. Clyne Heritage Society’s 2004 survey 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. The other two buildings on the map may be the salt man’s house, as depicted on the estate plan by John Farey, and a salt store.



Figure 3 A flagstone floor eroding from a sand dune at the site of the old salt pans

The other map that depicts buildings at the salt pans site is an estate plan dated around 1770. 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.

The estate plan by John Farey in 1813 does not depict buildings at the site of the old salt pans. 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 1813 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 covering the buildings. This would explain the presence of a network of sand dunes at the site today. It has been suggested by the author that the salt pan buildings were once inside a sand dune and the gradual effects of coastal erosion has 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 presumed that they belong to the salt pans. It is possible that a major storm event took place in the past; covering the site and Farey only reported the

fragments of the site that had been revealed by 1813. 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 pit and limekilns of the Inverbrora Coal Works.

The four pan houses erected in 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 to 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.

5. Aims and Objectives

This project has set out to record and survey the remains of a wall of unknown extent and purpose located on the Brora coastal foreshore at GR: NC 90950 03564, and threatened by coastal erosion. It is already known from documentary sources that this specific area was the location of different salt producing industries dating to 1598, 1614 and 1768. Prior to this survey the site comprised 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 has been visible for at least 30 years. It is possible that the wall was once covered by a sand dune and has become visible due to the effects of coastal erosion.

The author has compiled a record of the wall using photographs and sketches spanning over 30 years. The continual effects of coastal erosion and storms have prompted the author to seek assistance from other interested parties to survey the site before the evidence is lost forever.

The project aims and the methodology used are listed below.

Project Aims:

- Identify the nature and extent of the eroding features in the sand dunes
- Use an EDM to set up stations around the entire industrial complex
- Use EDM survey to monitor coastal erosion over time from a given starting point
- Detailed recording of eroding structures
- Record the coast edge (the top of the cliff) using an EDM in the area of the eroding features to enable the coastal erosion to be monitored over time
- Provide training and practise in archaeology methodology
- Locate the structural remains on a map or plan
- Relating these features to historical maps
- Compile a photographic record of the site for the duration of the survey

Methodology:

- Remove windblown sand back to in-situ archaeological layers
- Set up EDM stations to create entire site grid and base-line to tie in structures with known OS points.
- Plot other earthworks and visible features
- Detailed plans of eroding structure
- Detailed elevations of eroding structure
- Recording retrievable finds from surface layers

The time allocation allowed for the project was four days, with the option of a further two days if required. The volunteer list was drawn up primarily from members of North of Scotland Archaeological Society (NOSAS) and Clyne Heritage Society, as well as other interested individuals. In total, 20 volunteers participated in the survey over the four days, including 6 full time individuals and many others staying for a whole weekend.

The hot and sunny weather conditions over the first weekend made it quite difficult to work and periodically breaks were required to take on fluid and apply suntan lotion. The second weekend was a contrast with strong winds and rain hampering work at times. The added problem of sand blow slowed down work. An additional two days were spent backfilling the site after the completion of the survey to prevent further instability and erosion.

6. Results

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, what turned out to be, immense length, i.e. over 30m to date. Sadly, most of the upstanding structure has collapsed, but a well-constructed doorway made from finely dressed bevelled sandstone blocks was still evident with door jambs.



Figure 4 Volunteers at work removing windblown sand from the SW section of an eroding wall

The remainder of the wall that was exposed by removing windblown sand during the course of the survey revealed one to two courses of wall surviving above probable foundation stones. The foundation stones appeared to jut out in a consistent pattern about 15-20cm beyond the seaward side of bottom course of the wall, i.e. on the interior of the building.

A double skin construction method had been adopted, with infill mainly consisting 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 embedded between the larger sandstone blocks making up the double skin wall, which was generally around 1m wide. Most of the blocks were roughly dressed and tool marks can clearly be seen on some of the other blocks lying on the beach. The exterior face of the wall was carefully dressed and fine chisel tool marks can be seen where a mason has smoothed and patterned the surface. 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.

A seaward turn in the building was found on the last day of the survey, showing 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, by the sea. It is hoped that the sand dune complex contains more structural remains associated with the salt pans, which are known to date to three phases - 1598, 1614 and 1768.



Figure 5 A volunteer drawing the SW section of an eroding wall using a planning frame

7. Conclusions

The survey failed to reveal the true extent and nature of the wall. Further work is required to understand the relationship between this wall and a large rectangular building depicted on two maps, i.e. Taylor and Skinner (Scotland's First Road Atlas, 1776) and an estate plan dated c.1770 at the site of the old salt pans. It is possible that the large building depicted on these maps may be a salt ginal or it may have been subdivided into different pan houses. 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. It is possible that there are local variations in pan house construction across the country.



Figure 6 A pan house at St Monans in Fife, 2004

8. Recommendations

Deflated areas have been identified on top of a complex of sand dunes at the site of the salt pans. It is hoped that a geophysical survey will reveal evidence of built features and walls inside the dunes.

A follow-up survey is planned for another eroding building nearby with a flagstone floor. It is hoped that the Society can encourage Historic Scotland to Schedule this valuable industrial landscape. To learn more about the project on-line information is available at www.shorewatch.co.uk.

Clyne Heritage Society and Shorewatch have put forward a bid to Historic Scotland to fund more exploratory work at the salt pans site, which if successful, will begin in Winter 2005.

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

Jacqueline E Aitken, 2005

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