

# A Site of Multi-Period Use Since the Viking Age, Durness, NW Scotland

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## **1. Abstract**

The far northwest of mainland Scotland, and in particular the area centred on the parish of Durness, presents one of the most compelling sites for the study of Norse influence, as yet largely unexamined, in Britain. Situated at the junction of the Atlantic Ocean and the northern coast, bounded by Cape Wrath to the west and Loch Eriboll to the east, this landscape bears the imprint of Norse settlement, language, and governance that shaped its character from at least the late ninth century through the medieval period and beyond. Here we address a potential Norse settlement on the Faraid Head, Balnakeil Bay, near Durness. The site is located in a highly dynamic sand dune system which causes complications for any stratigraphic chronology of artifacts. Following a storm in 2020 a new blow-through opened up in the dunes, revealing multiple artefacts, mostly iron, emplaced on the underlying gravel basement. Some of the artefacts suggest Viking Age (9<sup>th</sup>-11<sup>th</sup> centuries AD) whilst others have been radiocarbon dated to the 17<sup>th</sup> and 18<sup>th</sup> centuries. A large number of smoothed pumice stones suggests on-site boat building or repair, and the preparation of animal hides. Geochemical analysis shows that the pumice originates from two separate eruptions of the Katla central volcano in Iceland. The dunes at Faraid Head are constantly shifting, and so the site likely contains a mix of artifacts from several different time periods. It is possible that Norse occupation persisted at the location, masked by later human activity.

## **2. Introduction**

Norse expansion into northern Scotland must be understood within the broader context of Scandinavian Scotland (9th-15th centuries), a period during which Viking and Norse settlers colonised peripheral Scotland. The two most northerly mainland provinces, Caithness and Sutherland, fell under Norse control at an early date, and the entire area west to Cape Wrath was drawn into an Atlantic Norse world characterised by sea-based mobility, agricultural settlement, distinctive legal institutions, and ultimately profound demographic change (Crawford, 1995). The Durness area, placed on the far northwest coast and offering sheltered anchorage and fertile pockets of land, was well integrated into these networks.

The evidence demonstrates that the Durness area was not merely touched by Norse influence but was substantially shaped by it, with Scandinavian elements persisting in place names, language, and population genetics to the present day. Norwegian adventurers reached the northern and western isles of Scotland via Shetland and Orkney, initially in search of plunder, until the raiding pattern gradually gave way to colonisation over the course of the ninth century. The Northern Isles of Orkney and Shetland, being closest to Norway, experienced the first and most long-lasting Norse influence of any part of Scotland.

Archaeological evidence for Norse presence and settlement along the northwest coast is embedded in the very landscape (e.g. Batey, 1993). At Smoo Cave (Figure 1), radiocarbon dates spanning the 8th–12th centuries AD from stratified midden deposits (rubbish heap), document Norse maritime activity

including fishing, and boat-building or repair (Pollard et al., 2005). At Sangobeg (Figure 1), a Norse-period settlement with stone walling, a hearth, and occupation deposits was excavated in 2000, overlying a late Iron Age child burial dated 170 BC-AD 30 (Brady et al., 2007). A horizontal mill at Loch Borrallie may be of Norse origin (Hardarson and Macdonald, 2022). A Viking burial at Balnakeil Bay was radiocarbon dated to Cal AD 680–860, with artefact typology suggesting a late 9th-century date (Batey, 1993, Batey and Paterson, 2012). The research site presented in this paper is located about 200 m south of the Viking burial (Figures 1 and 2).

A striking quantity of Norse to late Medieval metalwork of some status, has been found on the Loch Borrallie Headland (Figure 1). A few copper-alloy frustrum-headed pins have been discovered, dating from the thirteenth century. The presence of industrial waste, including metalworking slags, from several different locations on the headland suggests that small scale metalworking was taking place (Lelong and MacGregor, 2003, Hardarson and Macdonald, 2026a). Other pieces of metalwork, associated with Iron Age burials (MacGregor, 2004) may also have been made locally.

Together, these sites create a coherent picture of intensive Norse coastal settlement in the Durness area during the 9th–13th centuries, exploiting the fertile limestone grasslands, coastal fishing resources, and sheltered anchorages of the Kyle of Durness and Balnakeil Bay.

There is evidence of settlement from the late Norse period which continued to exist in the same place over perhaps the following 500 years. As such, the Durness area, the Borrallie Headland and Faraid Head, in particular, present an extremely important contribution to Medieval settlement studies in northern Scotland (Lelong and MacGregor, 2003, Gazin-Schwartz and Lelong, 2005, Hardarson and Macdonald, 2026a).

### **3. Research Area on the Faraid Head**

#### **3.1 Site Location and Description**

Faraid Head (An Fharaid) forms a rocky peninsula approximately 3.6 km long and up to 1 km wide projecting NNW into the North Atlantic (Figure 1). Its topography consists of Moine Supergroup psammites and mylonites, rising to a dissected plateau at approximately 60–70 m OD, with steep to precipitous cliffs on the northern and eastern margins and a gentler slope descending to the Balnakeil dune system and beaches to the west (Figure 1). Located approximately three kilometres north of the village of Durness, the Faraid Head and its immediate environs preserve an extraordinary compressed record of human activity spanning at least from the Bronze Age through the Iron Age, the Norse/Medieval era, the medieval Christian period, and into the modern age of military occupation (e.g. Hardarson and Macdonald, 2026b).

The dunes of Balnakeil (Figure 2) are some of the most active in Scotland and display important interactions between wave erosion and undercutting of the dune faces to large and active blow-throughs (e.g. Hansom, 2003). The dune system, driven by prevailing Atlantic winds, has been mobile throughout the Holocene (the last 12000 yrs), alternately burying and exposing cultural deposits. This dynamic nature creates a double-edged archaeological setting: on one hand, burial by wind-blown sand has preserved organic materials and some stratigraphic contexts that would otherwise have been destroyed; on the other, erosion of dune faces and blow-throughs can rapidly expose fragile material and artefacts to the elements and completely erase any chronological context in the field. However, evidence of sturdy palaeo-surfaces can be seen in the field, in particular about 200 m south of the research site where a dark, hard and irregular soil layer (15-25 cm thick), silica cemented, exposed in a less developed blow-through at 6-20 m OD. It acts as a "fossilized" surface, representing a specific period of landscape stability where erosion or deposition was paused. There are no age constraints on this layer but it may have acted as the original foundation for structures at the research area.



Figure 1. Research site (red box) and documented Norse sites in the Durness area (blue box).

In September 2020 following a storm, multiple iron artefacts and worked pumice were revealed in a newly formed blow-through in the sand dunes of the Faraid Head (NC 38800 70468, centre) about 200 m south of a known Viking burial (Batey and Paterson, 2012; Figure 2). The site rests on a gravel basement, about 3 m above and about 50 m away from the MHWS. The area of cobbles measured approximately 50 m by 10 m, with a NE/SW alignment (Figure 3).

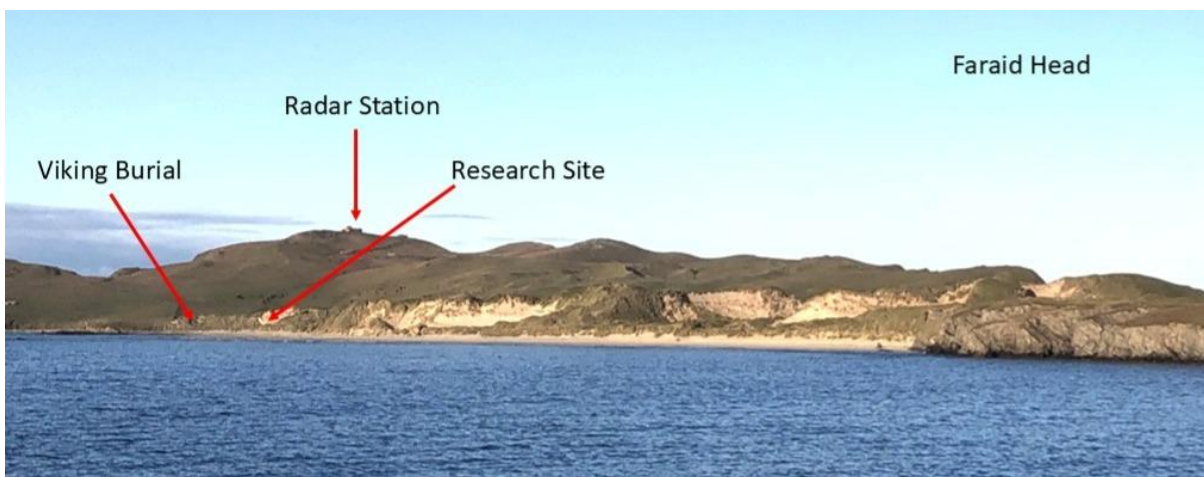


Figure 2. Location of research site on the Faraid Head in relation to Viking burial. Seen from the west.

The metal artefacts (and pumice) were mostly concentrated within a low-banked area measuring about 12 x 8 m NNE/SSW. The site consists of a linear dune deflation which has exposed an area of flat, rounded cobbles of various sizes. The cobbles range approximately from 5–10 cm in width and length with flat, eroded sides. They form a level floor-like surface and are mostly of gneiss, dolomitic limestone, quartzite, pegmatite, black mafic rocks and some psammite. It is of interest that most of the bedrock is psammite, which accounts for the minority of the pebbles.



*Figure 3. Raised gravel platform seen from the east (left photo) and from the west (right photo). Notice seaweed in the foreground of right photo. Person is standing on raised gravel platform.*

The find was reported to Kirsty Cameron of the HCAU and then to the HER. AOC Archaeology were commissioned to undertake a non-invasive survey at the site, which included topographic analysis, photogrammetry and geophysical surveys in addition to a comprehensive metal detecting survey. The main results of the AOC fieldwork were that evidence suggested that the site represents the remains belonging to a domestic structure related to possible Norse occupation (Engl and Hudson, 2021).

The central area of the site is raised by about 0.5m into a platform. Within this area three low lying banks of cobbles were visible. At the south-western end a shallow natural slope bounds the platform. Within the banked area was an 11 m x 8 m NNE/SSW aligned spread of nails and other artifacts. Geophysical survey results show an area of enhanced magnetism (possible archaeology) in the centre of the east side of the area (Engl and Hudson, 2021). It is located in the same site as the nail spreads identified in the topographic survey. Within the area of enhanced magnetism are three pit-like anomalies. Five additional pit-like anomalies (possible archaeology) are scattered through the site (Figure 4). Four ferrous spikes were identified in the centre of the site along with an area of enhanced magnetism on the east side of the research area (Engl and Hudson, 2021). Two hearths expressed as very burnt stones, mostly quartzite, were observed on the raised NE platform shown on Figure 4.

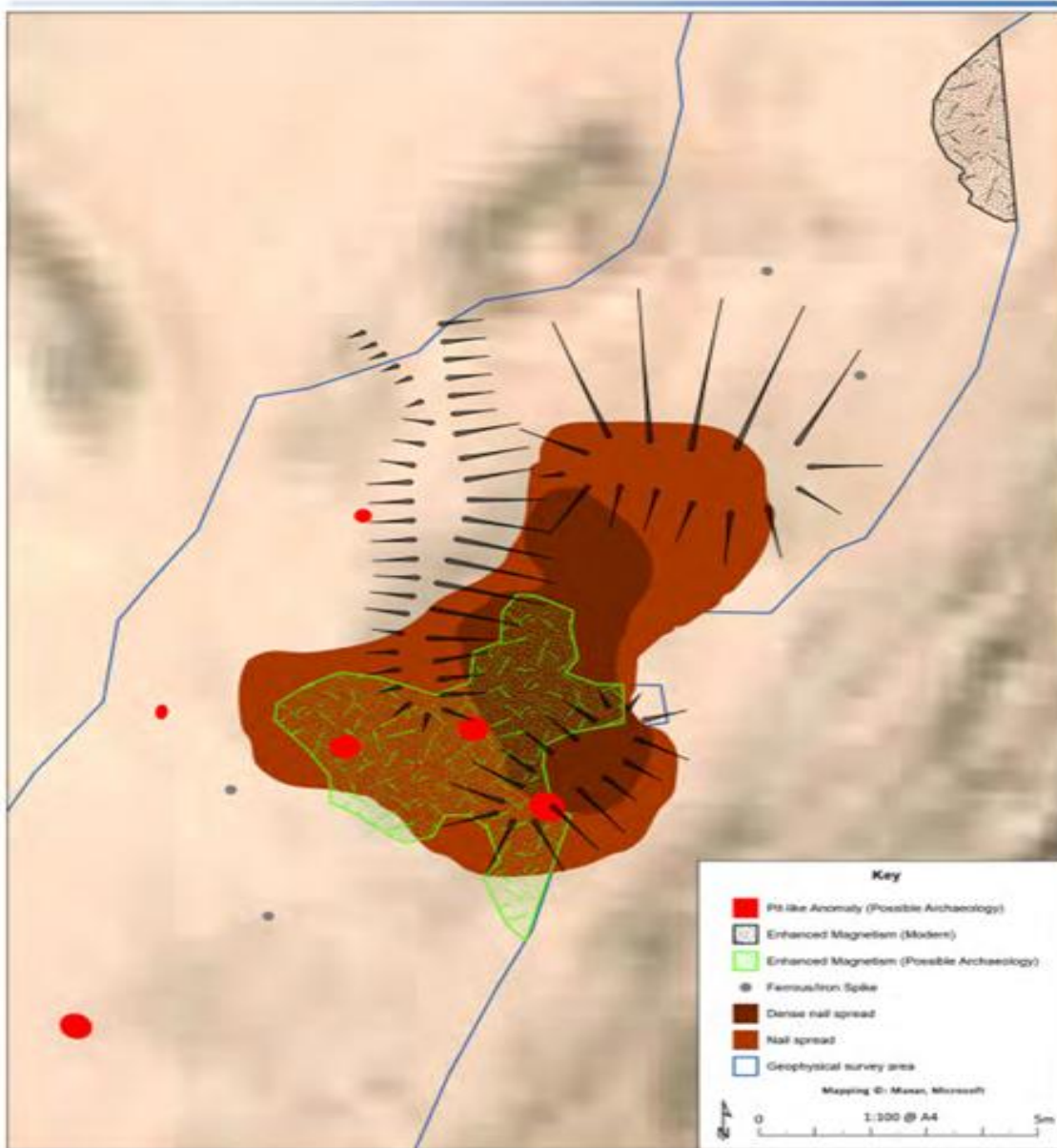


Figure 4. Geophysical results outlining a possible on-site structure (Engl and Hudson, 2021).

### 3.2 Sample Collection

Following a storm in September 2020 multiple artefacts resting on the underlying gravel basement were revealed in a new blow-through in the Balnakeil dunes. Due to the dynamic nature of the dune system and imminent sea erosion, we sampled a representative collection of artifacts, which were logged in the field, archived, and stored at Durness Deep Time in Balnakeil Craft Village. The artifacts are itemised in Table 1. Since 2020 the authors have regularly monitored the site. The blow-through has been expanding allowing increased sea erosion (Figure 3), and in early 2026, few of the surface iron artifacts remain, mostly due to exposure to the elements.

*Table 1. Summary of artifacts.*

<b>Artifact</b>	<b>(n)</b>	<b>Artifact</b>	<b>(n)</b>
Sickle in 4 pieces, without handle	1	Iron fish hooks	5
Penannular iron brooch in 4 pieces	1	Fish bones, cod heads and vertebrae	8
Iron pot lid (round)	1	Charred bones	12
Iron pot hook	1	Calcined bones	10
Iron pot fragments	8	Possible bone hairpin	1
Part of iron lock	1	Bones with cutmarks	4
Iron latch	1	Pottery fragment (grass-tempered?)	1
Iron nails/rivets with wood attached	4	Green glass shard with air bubbles	1
Iron nails/rivets with bone attached	2	Hammerstones	3
Iron nails fused	2	Stone scrapers	4
Iron nails, large (up to 15 cm long)	8	Whetstones	6
Iron nails, small (up to 7 cm long)	13	Stone sinkers	3
Iron rivets (up to 5 cm long)	10	Pumice, dark and pale brown, rounded	>70

### 3.3 Metal Objects

#### 3.3.1 Nails

Nails are the most common iron finds recovered from the archaeological site (Table 1) and they are moderately to extensively corroded (Figures 5 and 6). However, the general morphology (length and basic form) of the shanks could in most cases be determined. Currently no standardized recording practices exist for nail assemblages (Manby, 2024).

The shanks are all square or semi-square as would be expected of wrought iron nails. The heads are roundish, semi-square or slightly elliptical. Most of the shanks of the smaller nails are relatively straight but the larger nails are often slightly curved or hooked (Figures 5 and 6), which may be due to extraction (Manby, 2024).

In a few cases (n=6) charred wood or charred/calcined bone had become attached in the corroding nails and rivets (Figure 7). This may indicate that the metal was part of a structure that at some point had experienced a fire, or that the wood and bone were part of, on site, hearths. Calcined bone represents the final and most intense stage of heat alteration for bone (Stiner et al., 1995). The context in which the nails are found indicates that they were structural.

Two attached wood samples and one attached bone sample were radiocarbon dated at the SUERC. The results are described in section 3.5.2 below.



Figure 5. Small nails showing significant corrosion. Length up to about 7 cm.



Figure 6. Larger nails. Length up to about 12 cm.



Figure 7. Iron nails and rivets with embedded charred wood (upper), and bone (lower).

### 3.3.2 Rivets



Figure 8. Rivets and parts of rivets.

Several rivets, or parts of rivets (n=10) were sampled at the site (Figure 8). A rivet is a single-piece fastener with two heads connected by a shank; when in position the tip of the shank is flattened out to create what is in effect a second head, thus holding timbers in place. The heads of the sampled rivets are usually square or rectangular, but also with an irregular shape due to their deformation from flattening with a hammer. The rivet heads are 1,5-2,5 cm in diameter. They are mostly broken, but some are whole, about 5 cm long. The association between rivets and boat construction is a strong one, but not one limited to a specific period (e.g. Pollard et al., 2005). The presence of both heads would suggest that the rivet had at one time been attached to a boat timber which had totally decayed

or that damaged timbers cut from a boat, with rivets in place, were used as fuel on a fire. An extracted rivet would only have one head, and possible examples are seen in Figure 8, even though it is conceivable that one head may have corroded off the shank.

### 3.3.3 Pots and Hooks

Several shards of iron domestic appliances were collected, mostly pot fragments. These fragments are not of cast iron, flattish and often quite thick (up to 10 mm). The objects are mostly highly corroded and very difficult to recognize. Some samples are shown in Figures 9 and 10. Clear evidence of riveting was not seen.



Figure 9. Iron pot shards.

The upper part of figure 9 shows three pieces of iron found closely together. The top right piece appears to have had a hole in it, possibly and attachment of a handle.



Figure 10. Part of an iron hinge (top left), pot lid (upper middle) and other pot shards.

Top left sample in Figure 10 shows part of an iron hinge and to its right a fragment of a pot lid with a pot lid knob. All these fragments were found in close proximity and are assumed to be of a similar application.



Figure 11. Iron pot hook.

Figure 11 shows an iron pot hook used for suspending cooking pots, cauldrons, and pans over an open fire. They were key to managing cooking temperatures in central hearths, allowing cooks to raise or lower vessels to control heat. Two hearths were found at the research site.

### 3.3.4 Fish Hooks

Five fish-hooks were retrieved from the research site (Figure 12). They are 3-7 cm in length, slightly irregular and made of hand-forged iron. Some samples were so fragile they broke just by picking them off the ground. Fish hooks of this shape and form were used for hand-lining from boats and often paired with stone or iron sinkers (*cf.* Figure 19). Smaller hooks could be used with floats, like pumice (*cf.* Figure 20). Bigger hooks allowed for catching large species (e.g. cod, haddock). Several fish bones were found on-site, including bones from cod cranium (*cf.* Figure 16) and vertebrae. Cod and haddock are frequently caught through deep-sea fishing, though they can also be found in shallower waters depending on the season and location.



Figure 12. Fish hooks.

### 3.3.5 Iron Penannular Brooch

A considerably corroded iron brooch was recovered from the central area of the research site, broken into four parts (Figure 13). The penannular design is clear but the pin is missing. The artifact is too badly rusted for any decoration to be seen.

A copper alloy penannular brooch-pin was found in a Viking, ninth- or tenth-century burial, in Balnakeil Bay (Batey and Paterson, 2012). Another possible burial of a woman with tortoise brooches is known from Keoldale south of Loch Borrallie, two alloy brooches have been recovered on the Headland west of Loch Borrallie (Figure 1), and one east of the Kyle of Durness (Lelong and MacGregor, 2003). Another penannular well preserved bronze brooch, decorated with Norse inspired engraved designs on both sides, was recovered by the authors in the same area. Figure 1 clearly shows that the Borrallie Headland and the Faraid Head are practically the same area.



*Figure 13. Iron penannular brooch, broken in four parts.*

Archaeological finds at the Loch Borrallie area represent an important occupation site that saw use through the late Norse/Medieval period and into the eighteenth century (Lelong and MacGregor, 2003). The nature of the artefacts hints at a relatively wealthy settlement, able to afford copper alloy pins, brooches and other well-crafted pieces for personal adornment (Lelong and MacGregor, 2003).

### 3.3.6 Sickle

One curved, badly corroded, sickle was found on-site, broken in four parts (Figure 14). It is about 28 cm long and the handle is missing. It does not appear to be serrated. A similar rusty, iron sickle (broken in two) has been retrieved, by the authors, from the sand dunes about 450 m SE of the research site. The morphology of the sickle cannot be allocated to any specific period of time.

Sickles in Scottish archaeology represent key agricultural tools used from the Bronze Age through to the medieval period and was still used for cutting till the first half of the 19th century when the scythe became the primary agricultural tool for the harvesting of crops, likely barley.

One other rusty, curved iron sickle has been found on the Borrallie Headland (Figure 1), but exact location and context is not known (Lelong and MacGregor, 2003).



Figure 14. Sickle (28 cm long), broken in four parts.

### 3.4 Pottery and Glass



Figure 15. Glass shard with numerous air bubbles and some impurities (8 mm in length), pottery fragment, possibly grass-tempered (14 mm in length).

Only one pottery fragment and one glass shard were retrieved (Figure 15). The pottery appears to be grass-tempered which may indicate a late Norse date (see Lelong and MacGregor, 2003). The glass is relatively thick (5 mm), opaque and full of air bubbles. Air bubbles are often found in older, handmade glass but otherwise not indicative of a specific era.

### 3.5 Bone

#### 3.5.1 Bone Samples



*Figure 16. Sheep or goat horn (top left), bones with cut-marks, possible hairpin (left middle) part of otter jaw (right middle), claw of bird of prey (right of ruler), fish head (cranium) bones (cod, lower right).*

A significant assemblage of bones was seen in the research area, some of which were sampled (Figure 16). Most of the bones were fragmented and barely identifiable. Domesticated animals were represented by bones of cattle, sheep (or goat) and pig. Wild animals were represented by part of otter lower jawbone. Red deer was not identified with certainty.

The mammal bones were largely long bones, ribs and vertebrae and small bone fragments. Cut marks were fairly common and several long bones appeared to be broken at an unnatural angle and occasionally lengthwise which implies bone marrow extraction (Figure 16).

A number of bird bones were found but not sampled except for a claw from a bird of prey and a possible hairpin, which appears to be worked (Figure 16). Bones of fish were abundant, mostly head (cranial) bones and vertebrae. The cranial bones were from cod and possibly haddock. Bones from larger fish species in conjunction with rivets, fish-hooks and sinkers clearly indicates off-shore boat fishing.



Figure 17. Charred bones (above ruler), calcined bones (below ruler). Top left sample is worked to resemble fish.

A substantial number of charred and calcined bone fragments were seen on site and more than 20 were sampled. One of the charred bones appears to be polished and worked in a shape and form resembling a fish head (Figure 17). The burnt bones clearly indicate food production and domestic rubbish. Two hearths were located at the research site, probably the source of the cooking facility.

In a few cases (n=6) charred wood or charred/calcined bone had become embedded in the corroding nails (Figure 7). This may indicate that the nails were part of a structure that at some point had experienced a fire, or that the wood and bone were part of, on site, hearths. Calcined bone represents the final and most intense stage of heat alteration for bone (Stiner et al., 1995).

When bone is burned, it goes through a series of stages that begin with discoloration and denaturing of the collagen, followed by charring, total combustion of the organic fraction, combustion of the inorganic carbon fraction, and finally recrystallization of the bioapatite. All organic carbon has burned away by around 600°C, at which point bone colour has shifted from grey to light bluish-grey (Figure 17). By 650°C the bone has become pure white calcined state (Chatters et al., 2017).

### 3.5.2 Radiocarbon Dating

Two samples of wood, which had become attached to nails and one attached bone sample were radiocarbon dated at the SUERC in East Kilbride. Results of the radiocarbon dating are found in Appendix 1 and descriptions of the analytical techniques employed by the SUERC Radiocarbon Laboratory are described in Dunbar et al. (2016).

*Table 2. Radiocarbon determinations from the research site in Balnakeil Bay. See Appendix 1 for details.*

Laboratory Code	Sample	Lab. Age BP	$\delta^{13}\text{C}$	Calibrated Dates	All the dates are AD
				1 sigma (68.3%)	2 sigma (95.24%)
SUERC-101347	Wood	95 ± 24	-25.5 ‰	1696 - 1724 (21.9%)	1691-1728 (25.8%)
				1813 - 1838 (19.9%)	1809-1920 (69.7%)
				1879-1914 (26.6%)	
SUERC-101348	Wood	244 ± 24	-22.6 ‰	1643-1665 (51.3%)	1527-1552 (4.3%)
				1785-1794 (17.0%)	1633-1675 (62.9%)
					1743-1750 (0.9%)
					1765-1800 (27.4%)
SUERC-101349	Bone	213 ± 24	-14.7 ‰	1651-1675 (26.5%)	1646-1684 (33.7%)
				1743-1750 (4.6%)	1735-1804 (54.5%)
				1765-1799 (37.1%)	

Table 2 shows the date range of wood and bone attached to iron varies significantly, from 1527-1920 cal AD (all dates are expressed at the 2-sigma level of confidence (or 95.4%). However, when the data are scrutinized, we see that one wood sample (SUERC-101348) and the bone sample (SUERC-101349) overlap, 1527-1800 cal AD and 1646-1804 cal AD respectively, the mid 16 hundreds to late 17 hundreds, showing a good correlation. The wood was attached to a rivet and the bone to a nail. In fact, the date range of the other wood sample, which was attached to a nail (SUERC-101347), partly falls within the same range (1691-1920 cal AD).

The origin of the wood and bone is ambiguous. The wood may have been part of an on-site structure which was later abandoned and gradually yielded to the elements and deteriorated. The wooden fragments were gradually embedded or enclosed in the corroding metal. A more likely explanation is that the site was quite active during 17<sup>th</sup> and 18<sup>th</sup> centuries and that the wood and bone material originated from hearths located at the research site.

The abundance of nails and, in particular rivets, clearly indicates the presence of boats and boat repairs at some point in history. Nails and rivets found in Smoo Cave and Glassknapper's Cave (Figure 1), are of a type known to have been used on Viking and Late Norse vessels (Pollard et al., 2005). The presence of both rivet heads would suggest that the rivet had at one time been attached to a boat timber which had totally decayed as opposed to rivets or nails which had been extracted from timbers, a process that would have dislodged or damaged at least one head (Pollard et al., 2005, Manby, 2024). It is feasible that damaged timbers cut from a boat, with rivets in place, were used as fuel on a fire, a process that would have left the rivets undamaged. The attached wood which was radiocarbon dated, could have been introduced in such a fire, as could the bones, animals being cooked on the same fire.

### 3.6 Lithic Samples

#### 3.6.1 Whetstones and Sinkers



Figure 18. Whetstones made of Durness dolomitic limestone.

Six whetstones were sampled, four of which are shown in Figure 18. They are flat and elongated and were identified by their characteristic wear patterns, where one flat surface was smoother than the other due to sustained, repeated rubbing. Some scratches are observed. The stones are all Durness dolomitic limestone, which is not the bedrock of the Faraid Head, but across the Balnakeil Bay they are the bedrock and very common on the shores of the Borrallie Headland (Figure 1).

Two worked stones, clearly used as net-sinkers, were retrieved from the research site. They have deep cuts for attachment of rope of some kind. One consists of a mafic rock, commonly found on the Faraid Head, the other is of Durness dolomitic limestone called leopard rock (Figure 19).



Figure 19. Sinkers, mafic rock left (probably Scourie dyke composition). Leopard rock (thrombolite, Durness dolomitic limestone) right.

### 3.6.2 Pumice Samples

More than 70 pumice samples were collected from the research site (Figure 20). They were mainly concentrated within the same area as the nails and other metal artifacts (Figure 4). The pumice consists of two generations; one being dark, almost black, the other being light-brown or brown in colour. The size varies from 1-15 cm and most are smooth and rounded (Figure 20). Some are smooth and flattish, whilst others are round on one side and flat on the other. The roundness and different shapes results from the function they were being used for. The chemical composition of the samples shows that the pumice originates from the Katla central volcano in South Iceland (see section 3.6.3). Other pumice stones have not been recovered out of context on the Faraid Head, but one was present amongst Viking burial artifacts 200 m to the north (Batey and Paterson, 2012).

Pumice is found around the shores of much of the northern North Atlantic region (Newton, 1999). It is located in natural contexts, such as raised- or present-day beaches or at archaeological sites. Pumice has been discovered throughout the British Isles, with a major concentration in Scotland. The vast majority of reported pumice finds have been from archaeological sites (88%), rather than natural beaches. The archaeological sites date from Mesolithic to Medieval times (Newton, 1999).

Most of the pumice in Scotland is found on the Inner and Outer Hebrides, Orkney and Shetland. Pumice finds have been rare on the Scottish mainland. Of only 17 mainland sites, ten are from archaeological and seven from a natural context (Newton, 1999). On the north coast of Scotland pumice has been recovered at Achaidh Mhóir, Strathnaver (1 sample of unknown context; Newton, 1999), at the Viking burial in Balnakeil Bay (1 sample; Batey and Paterson, 2012) and at the Norse settlement at Sangobeg (2 samples; Brady et al., 2007; see Figure 1 for location). Our collection from the research area is in the excess of 70 samples.

Whilst it is probable that most of the pumice found in Scotland was rafted from Iceland (e.g. Newton, 1999, Farnsworth et al., 2020) and recovered from contemporary or raised beaches, it is also possible that Icelandic traders and visitors brought some of it by ship from Iceland (e.g. Newton, 1999). Icelandic Vikings travelled frequently to Orkney and from there along the North coast to the Western Isles and Ireland. In the south of Iceland, pumice is found in large quantities and being a very useful tool for a great variety of functions, it could have been sampled in Iceland and traded in Scotland. It is also possible that pumice was collected from an older settlement site, perhaps from a midden or some other abandoned buildings.

Pumice stones found on archaeological sites often show obvious signs of wear, with grooves and holes created by sharpening or shaping of various objects. Pumice served a wide range of practical purposes, including the smoothing and finishing of wood, bone and antler, the working of animal hides, floats for fishing nets and lines, Norse funerary contexts, the preparation of parchment in monastic contexts, personal hygiene and grooming, and general abrasive use in domestic crafts. It was also used in jewellery (e.g. Newton, 1999, Clarke, 2005, Smith, 2007, Ness of Brodgar Project, 2024).

The natural supply mechanism, Icelandic pumice floating ashore on the beaches of the Northern and Western Isles, meant that access to the material was essentially cost-free and required little or no trade infrastructure. This helps explain the material's ubiquity across sites of very different status, from the high-status Norse burial at Balnakeil to the monastic scriptorium at Portmahomack (Carver et al., 2005).

The working of animal hides and the finishing of bone and antler objects were central activities in Norse domestic economies. Experimental and documentary evidence from Viking Age and early medieval contexts indicates that pumice played an important role in the smoothing and preparation of worked bone, antler, and organic materials. The grooves observed on pumice from Norse-period Orkney are consistent with the repeated passage of bone pins or similar objects across the stone's surface (Clarke, 2005, Ness of Brodgar Project, 2024).



Figure 20. Selection of pumice stones, dark and light brown.

### 3.6.3 Geochemical Analysis of Pumice

All analysed pumice northern North Atlantic region can be correlated to volcanic activity in Iceland (Newton, 1999). These analyses establish that the majority of the mid- to late-Holocene pumice found in the North Atlantic area is dacitic (silicic) in composition and erupted from the Katla central volcano.

Nearly 90% of Katla tephra layers are basaltic and classified as Fe-Ti basalt to basaltic andesite (low silica content). However, 17 silicic ( $\text{SiO}_2 = 63\text{-}67$  wt.%) tephra layers (called SILK) have been identified, ten of which are linked to pumice production between c. 6600 and 1626  $^{14}\text{C}$  years BP. It is important

that different eruptions have a distinct geochemical character (e.g. Newton, 1999, Farnsworth et al., 2020). Geochemically different and older pumice occurs in Mesolithic archaeological sites in Scotland which was also produced by Katla. Some of this older Mesolithic pumice was probably erupted by Katla c. 7000 <sup>14</sup>C years BP (Newton, 1999). This has applications for archaeology, as almost all the SILK layers have been radiocarbon dated, i.e. radiocarbon datable material, embedded in, or resting immediately above or below the tephra horizon.

High quality geochemical data can be used to correlate between pumice deposits and sources. However, pumice found in archaeological sites, could have been gathered from a beach a few months after an eruption, or from an older raised shoreline or archaeological sites. For this reason, pumice is not a precise dating tool in archaeology on its own, but can be very beneficial when combined with other data.

Two pumice samples from the research site, one dark and one brown, were selected and analysed by electron probe microanalysis (EPMA), using a JEOL JXA8230 Super-Probe at the Institute of Earth Sciences, University of Iceland. Analytical results are found in Appendix 2. For analytical techniques see Matthews et al. (2024).

In Figures 21 and 22 wt.% MgO is plotted against wt.% CaO. Samples from the research site (green and orange) plot with SILK (dacitic) samples from the Katla volcanic system in Iceland. Figure 21 shows that the brown or pale brown pumice from the research site plots with SILK group A, whilst the dark or black pumice plots with SILK group B. This shows that the samples originated from different eruptions, possibly thousands of years apart. It is highly unlikely that rafted samples would arrive at the exact same location. The pumice must have been gathered at some point from different locations and brought to the site of research. Alternatively, they could have been brought from the south of Iceland where the pumice is all mixed up.

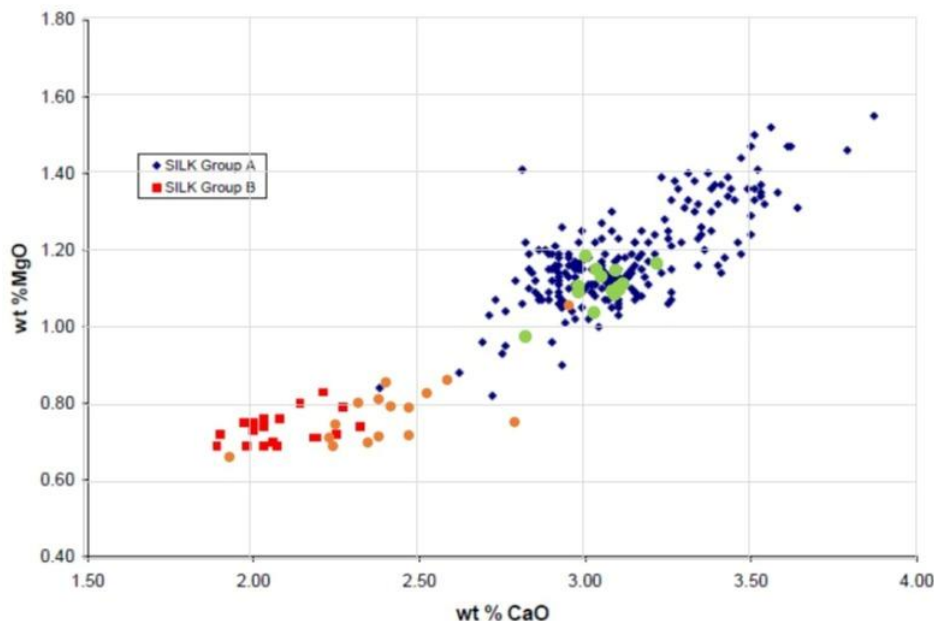


Figure 21. CaO vs MgO analyses compared to analysed pumice samples from the Katla central volcano in Iceland (Newton, 1999). Green and orange circles are from this study, representing brown pumice sample and black pumice sample respectively.

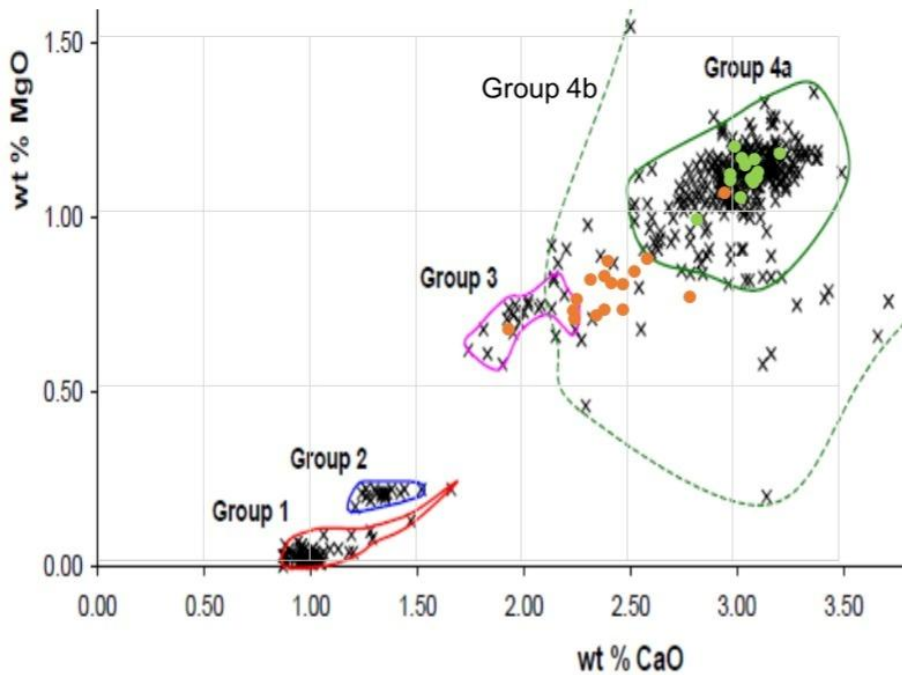


Figure 22. CaO vs MgO analyses compared to analysed pumice samples retrieved from archaeological sites in Scotland (Newton, 1999). Green and orange circles are from this study, representing brown pumice sample and black pumice sample respectively.

Four main groups of pumice have been chemically identified (Figure 22) at archaeological sites in the British Isles (Newton, 1999).

Groups 1 and 2: From archaeological sites on Shetland and Colonsay, from Mesolithic to Medieval.

Group 3: From a Mesolithic site at Staosnaig, Colonsay. Erupted from Katla between 7000 and 7500 <sup>14</sup>C years BP.

Groups 4a and 4b: Group 4a is from Outer Hebrides, Barra, Shetland and Ireland, ranging from Neolithic to Norse sites. Most of the pumice pieces from Group 4b are from Iron Age to Medieval sites (Newton, 1999).

The brown or pale brown pumice samples from the research site plot with Group 4a in Figure 22, and the black pumice with Group 4b, both groups being found in Neolithic to Norse sites in Scotland.

The age of the pumice sampled in this study could be anywhere between 6600 and 1626 CBP. As our focus is Viking age or younger that does not have chronological implications for our research. However, this exercise has shown that the pumice originated from the Katla central volcano in Iceland, in at least two separate eruptions, and the chances of these two generations of pumice stones having drifted into a small concentrated location on Balnakeil beach, thousands of years apart, are slim.

#### 4. Discussion

The Durness area of northwest Sutherland contains some of the strongest evidence of Norse settlement found anywhere on the Scottish mainland. Place names such as Durness, Eriboll, Smoo, Arnaboll, Hope, Keoldale, and Sango are not simply historical curiosities, they form a coherent Norse naming system that has survived over a thousand years of Gaelic and English influence. These names reflect the practical knowledge of Norse settlers: where they built their farms, how they used the sea, and how they organised the land under the authority of the Orkney earldom. Viewed together,

through its place names, its archaeology, and even the genetics of its people, Durness is fundamentally a Norse landscape.

Batey and Paterson (2012) proposed that Norse settlements, and possibly even a cemetery, may lie buried beneath the sand dunes close to the known Viking burial site at Balnakeil Bay. While several Norse burials have been found along Scotland's north coast, actual settlement sites remain rare. Even so, analysis of Norse place names has led researchers to argue that the entire north coast of Scotland should be treated as a single, connected Norse landscape when studying its names and origins (Waugh, 2000; Lelong and Gazin-Schwartz, 2007; Batey and Paterson, 2012). The geography supports this view: Durness sits roughly 100 km from both Orkney and the Western Isles, placing it squarely on a well-travelled Norse sea route. Historical sources confirm this. The Saga of King Hákon IV for example, written by Sturla Þórðarson in 1264-1265, records Viking voyagers sheltering in the area as they rounded Cape Wrath (known to the Norse as Hvarf).

It is simply not credible that people would have chosen to build homes or bury their dead in shifting sand dunes on an exposed, storm-battered beach. This means the landscape visible at Faraid Head today must be very different from the one that existed a thousand years ago, when the area was inhabited and when a Viking boy was buried nearby. Aerial photographs of Balnakeil Bay show how shallow its waters are, suggesting that the sandbanks visible in Figure 23 were once dry land covered by machair, the fertile, low-lying grassland typical of Atlantic coastlines. The shape and extent of the dune system have also almost certainly changed significantly over this period.

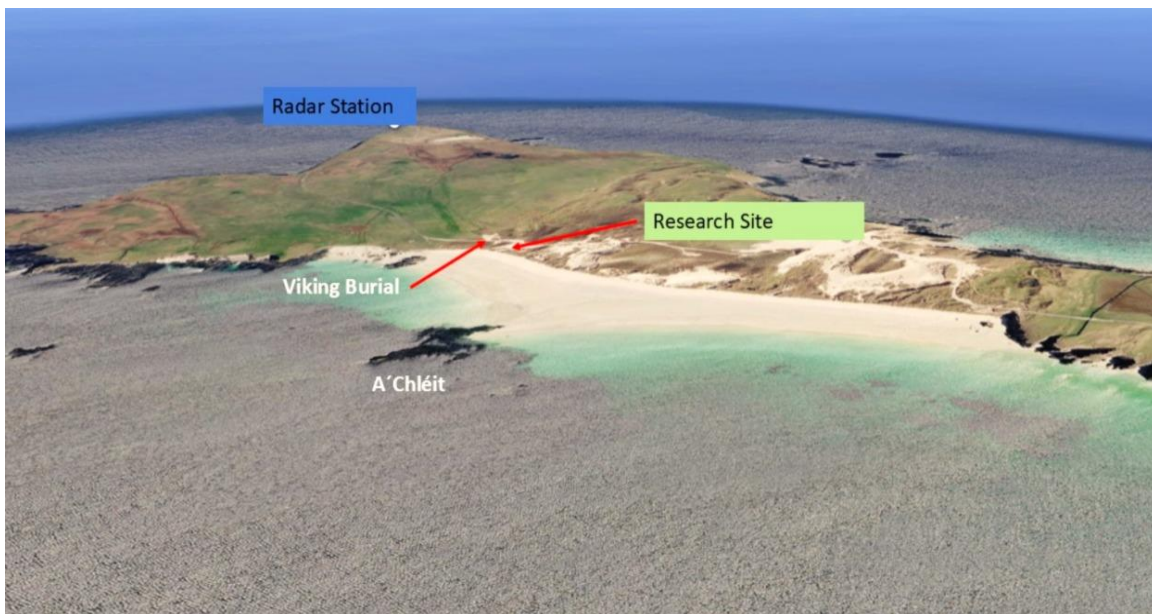


Figure 23. The Faraid Head and the research area seen from the west. Notice how shallow Balnakeil Bay is west of the Faraid. From A'Chléit to the shore is 350 m (Google Earth).

Several lines of evidence point to a complex pattern of land and sea-level change in this region. Variations in the rate at which the land has rebounded since the last Ice Age, combined with rising sea levels and more frequent storms, all support a model of localised coastal change (e.g. Mörner, 2015). The area's position near the Moine Thrust Zone, a major geological boundary where the thickness of the Earth's crust changes markedly, may also have influenced how quickly the land has risen in different places along the coastline on either side. Sea-level changes specific to the stretch of coastline of mainland Scotland are well documented (Barlow et al., 2014). Northwest Scotland has been slowly rising since the last glaciation, and this uplift has largely cancelled out the global rise in sea levels, keeping relative sea levels fairly stable over the past thousand years. That said, by using data from

nearby Loch Eriboll (Long et al., 2016) it is possible that sea levels here may once have been as much as 80 cm lower than they are today.

Records indicate that the rate of relative sea-level (RSL) rise in northwest Scotland did not exceed 0.4 mm per year between around AD 200 and 1940. While a more rapid rise during the twentieth century cannot be ruled out, any such acceleration appears to have been modest and to have occurred later than equivalent changes recorded in the western North Atlantic, possibly pointing to regional differences in what is driving sea-level change in the Durness area (e.g. Barlow et al., 2014). Pinning down precise figures remains difficult, however, because of the many interacting local processes involved and the significant uncertainties attached to current measurements (Rennie and Hansom, 2010).

Since around 3000 BCE, average sea levels across the whole of northern mainland Scotland have remained broadly stable, staying within approximately one metre of their present level (Long et al., 2016). The picture for the north coast of Sutherland, however, differs considerably from that of central-western Scotland (Shennan et al., 2000), and these differences would have had real consequences for what the coastline looked like and how accessible it was by sea during the Bronze Age (c. 2200–800 BC) and the Viking Age (c. AD 790–1100).

Salt marshes in northwest Scotland show no clear shift from falling to rising sea levels over the past 2,000 years. Changes in local coastal behaviour are more likely to reflect shifts in sediment supply, increased storm activity, or a combination of both. Evidence from the Outer Hebrides points to a period of intensified sand movement between AD 1400 and 1700, which researchers link to a stormier Atlantic climate during the Little Ice Age — itself associated with greater sea ice coverage and a steeper temperature difference across the North Atlantic. Whether this reflects more frequent storms or simply more powerful ones remains debated (Barlow et al., 2014). The research site's westerly aspect makes it particularly vulnerable to Atlantic storms arriving from the west, compounding its exposure.

Over the past thousand years, Scotland's coasts have experienced significant and shifting patterns of flooding, erosion, and sand movement. Two periods stand out as especially destructive: 1620–1700, at the height of the Little Ice Age, and again between 1850 and 1875. The main drivers behind these episodes include the tracks taken by Atlantic storm systems crossing northwest Europe, the strength of associated winds, tides, and storm surges, predominantly from westerly and south-westerly directions (Hickley, 1997). At Faraid Head, waves regularly reach the foot of the dunes on the western side, causing ongoing erosion and collapse of the dune face above. This part of Balnakeil Bay is likely to operate at a budgetary loss in terms of sand input and output (Hansom, 2003).



*Figure 24. Fossil soil horizon found in a blow-through 200 m south from the research site, representing a palaeo-surface later buried by sand. Person is standing on the hard surface of the soil horizon.*

Approximately 200 metres south of the main research site, a dark, dense layer of soil can be seen exposed in the dune face, lying between 5 and 18 metres above sea level (Figure 24). This is a fossil soil, or paleosol, an ancient ground surface preserved beneath later sand deposits. It is noticeably harder and more compact than the surrounding sand, ranging from 12 to 30 cm thick, and contains organic remains including root traces. Although it has not yet been formally analysed, its composition, including cemented quartz and feldspar grains, suggests it represents a stable, vegetated land surface that was eventually overwhelmed and buried by encroaching sand.

We propose that during the Viking Age, the shallow waters now covering much of Balnakeil Bay were in fact dry land, a broad machair plain (Figure 25) that is now preserved only as the buried soil layer. If correct, the shoreline once lay 250 to 350 metres further into the bay than it does today, meaning the coast would have run directly in front of both the research site and the Viking burial. This lost landscape would have provided valuable grazing land and other resources for the Norse communities living on Faraid Head.

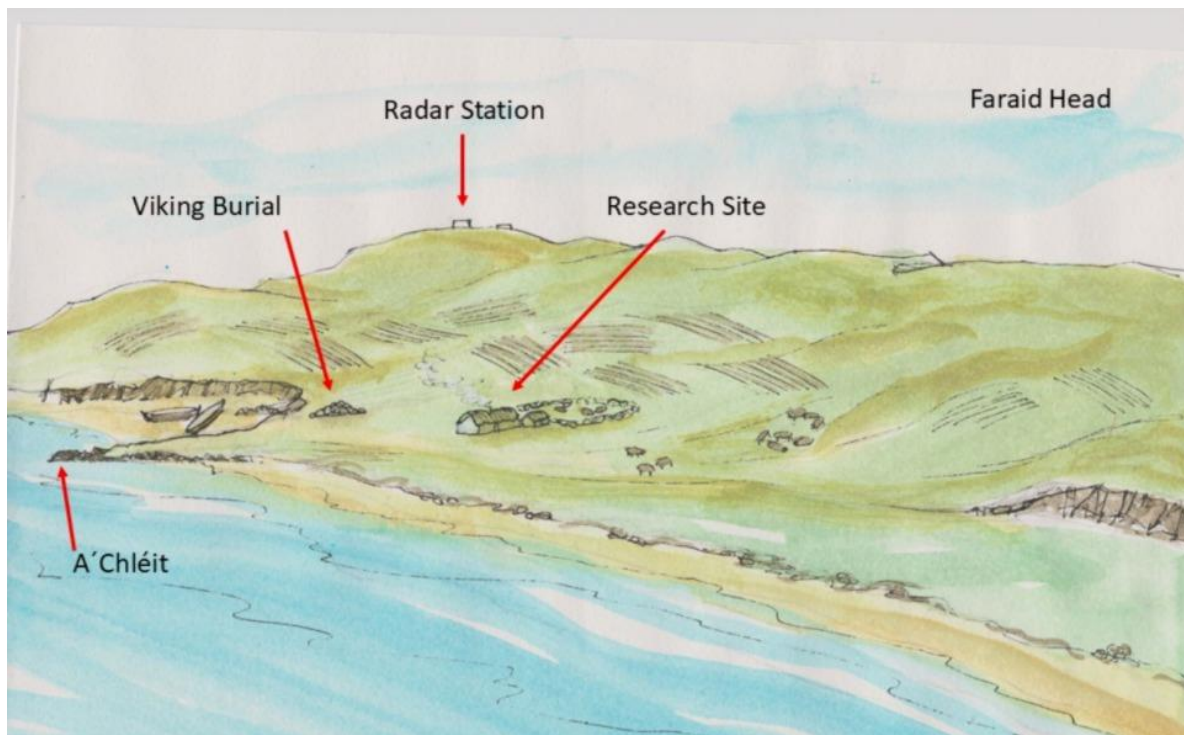


Figure 25. Reconstruction of the Faraid head back to Viking times. Refer to Figure 2 for location. A wide Machair has replaced the shallows seen in Figure 23.

## 5. Conclusions

This paper explores a possible Norse settlement at Faraid Head, Balnakeil Bay, near Durness. The site's location within a dynamic sand dune system complicates traditional stratigraphic chronology. In 2020 a storm created a new blow-through in the dunes, exposing various artefacts, predominantly iron and pumice stones, resting on the underlying gravel basement. Due to the dynamic nature of the dune system and sea erosion a representative collection of artifacts was sampled.

At the heart of the site, the basement rises about half a metre to form a platform, roughly 50 by 10 metres in size. A geophysical survey revealed an area of enhanced magnetic activity at the centre, pointing to possible buried archaeology, including three pit-like features. Five additional pit-like features were found across the wider site. Two hearths were recognized on the gravel platform. Together, these findings suggest the site once hosted a domestic structure of some kind.

Several iron rivets were recovered. Rivets of this type are closely associated with Viking and Late Norse boat construction, and they closely resemble examples found at nearby Smoo Cave (Pollard et al., 2005). This strongly suggests boat-related activity at the site.

Fishing was clearly practised here, supported by fish hooks and fish bones, as well as pumice used as floats and net sinkers, pointing to both inshore and deep-sea fishing at different times in the site's history.

Burning of bone is indicative of human consumption. Samples from throughout the deposits included cattle, sheep and pig bones, some of which are charred or calcined. Many of these bones exhibit cut marks, which suggests that meat was processed on-site. Iron pot sherds and an iron pot-hook add further evidence of domestic activity.

A notable quantity of smoothly worn pumice was found at the site. Pumice had many uses in Norse society, smoothing wood, bone, and antler; processing animal hides; serving as net floats; and general household tasks. Here, it was likely used to work boat timber or deer hides. Although no deer bones were found, historical records confirm that deer were driven onto Faraid Head and killed there (Hardarson and Macdonald, 2026b); the absence of bones probably means the carcasses were processed and the meat carried away elsewhere.

Geochemical analysis traced the pumice to the Katla volcano in Iceland, deposited across at least two separate eruptions sometime between 6,600 and 1,626 years before present.

Radiocarbon dating of wood and charred bone attached to iron nails and rivets produced dates ranging from around 1633 to 1804 AD, broadly the early-17th to late 18th centuries. The wood may have come from a structure that was eventually abandoned and decayed. More likely, it originated from hearths, reflecting a period of intensive activity at the site during this era.

The overall assemblage, rivets, hooks, bones, pottery, hearths, and pumice, is consistent with what one would expect from a permanent settlement, even allowing for the small number of pottery. Further evidence may still lie buried within the gravel platform beneath. The picture that emerges is of a site occupied from the Viking Age and continuing in use, for various purposes, into the 19th century.

The authors propose that during the Viking Age, the shallow waters now covering much of Balnakeil Bay, were in fact dry land, a broad machair plain extending into the present Balnakeil Bay. The land was later covered by sand dune activity, probably caused by increased storminess and gradual sea-level rise in the 17th and into the 18th centuries. This lost landscape would have provided valuable grazing land and other resources for the Norse communities living on Faraid Head.

## **6. Acknowledgements**

We gratefully acknowledge the Council of the Society of Antiquaries of Scotland and Simon Gilmour for funding the radiocarbon analyses, and Audrey Scardina for reviewing the grant application. We also thank Elaine Dunbar and Fin Stuart at SUERC for their work regarding the radiocarbon dating, and Gudmundur H. Gudfinnsson (University of Iceland) for his analysis of the pumice samples. Finally, we appreciate the invaluable field assistance provided by Cailean Young, Susan Waldron, Fin Stuart, Audrey Scardina, and Sam Mills.

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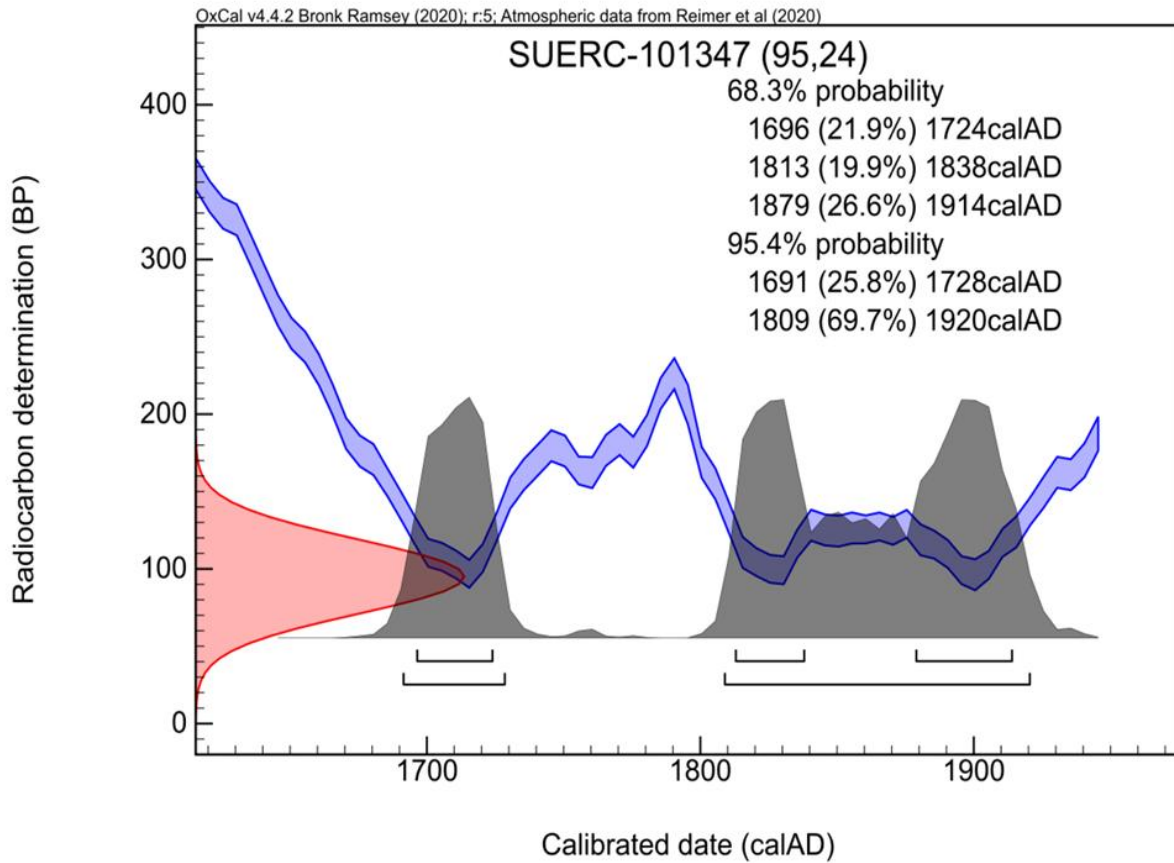
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# APPENDIX 1

## Radiocarbon Analyses

Laboratory Code: SUERC-101347 (GU59397)  
Submitter: Björn Hardarson  
Site Reference: Balnakeil Bay, Durness, Sutherland  
Context Reference: wood attached to nail  
Sample Reference: BNK-01  
Material: wood  
 $\delta^{13}\text{C}$  relative to VPDB: -25.5 ‰  
Radiocarbon Age: BP  $95 \pm 24$



## APPENDIX 1 (Cont'd)

Laboratory Code: SUERC-101348 (GU59399)

Submitter: Björn Hardarson

Site Reference: Balnakeil Bay, Durness, Sutherland

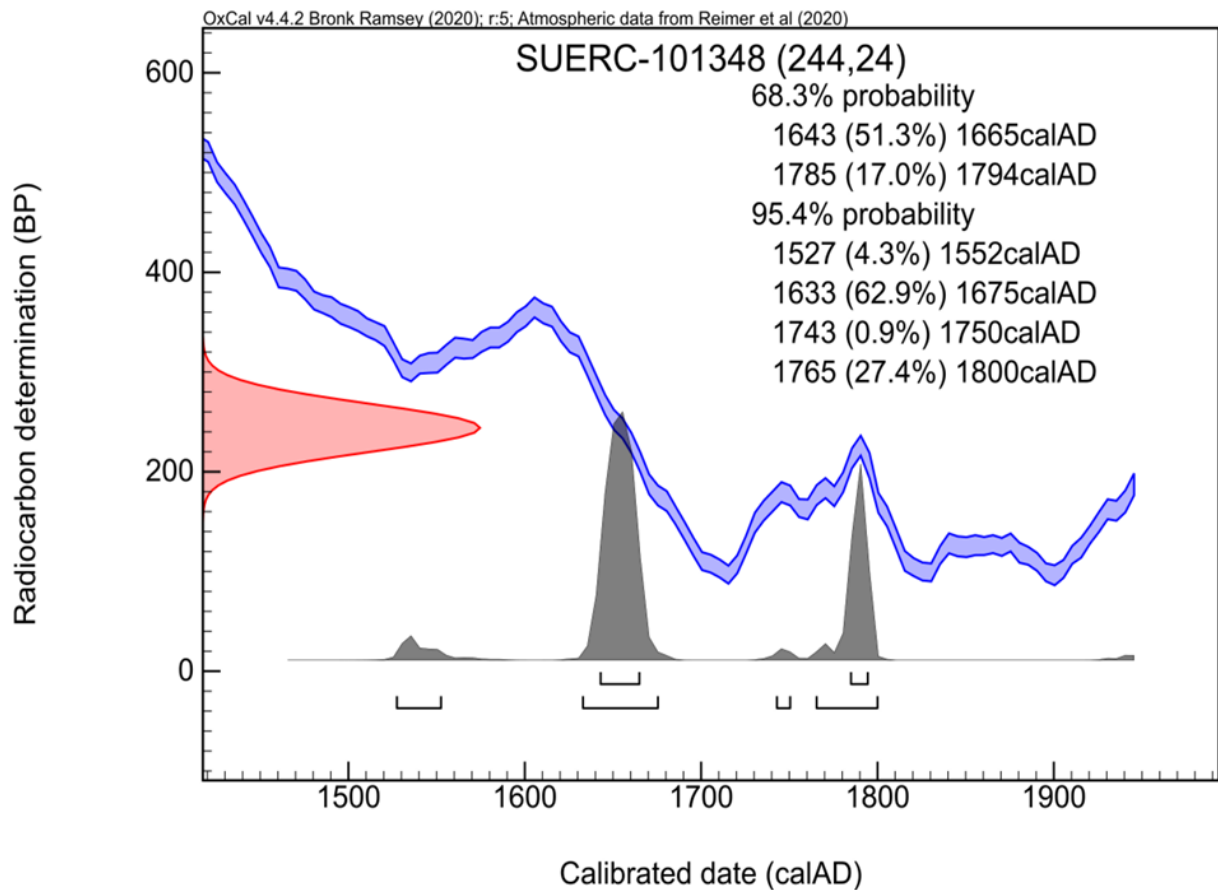
Context Reference: wood attached to rivet

Sample Reference: BNK-03

Material: wood

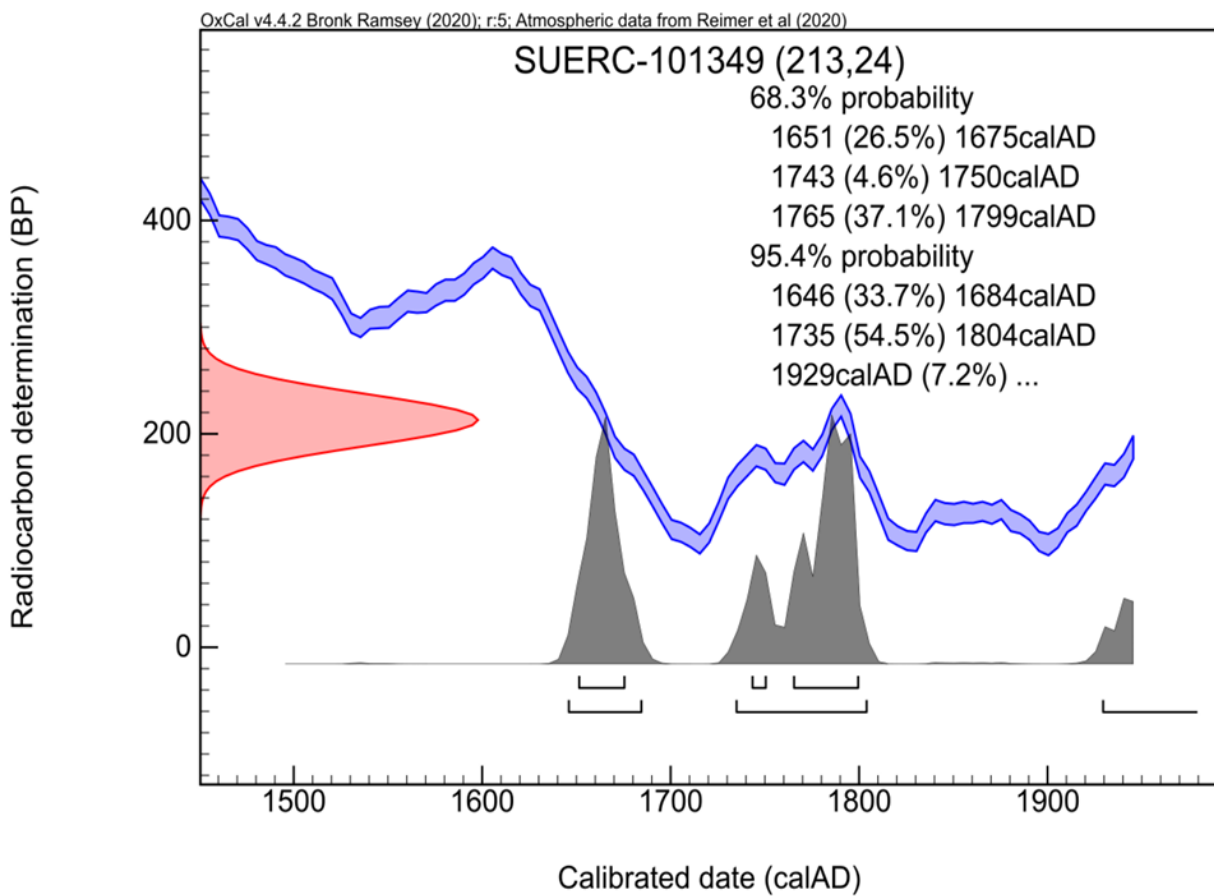
$\delta^{13}\text{C}$  relative to VPDB:  $-22.6\text{‰}$

Radiocarbon Age BP:  $244 \pm 24$



## APPENDIX 1 (Cont'd)

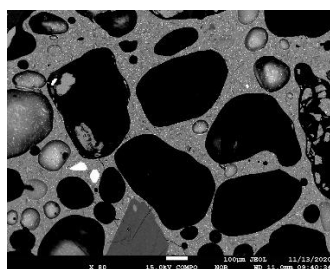
Laboratory Code: SUERC-101349 (GU59400)  
Submitter: Björn Hardarson  
Site Reference: Balnakeil Bay, Durness, Sutherland  
Context Reference: bone attached to nail  
Sample Reference: BNK-04  
Material: cremated bone  
 $\delta^{13}\text{C}$  relative to VPDB: -14.7 ‰  
Radiocarbon Age BP: 213 ± 24



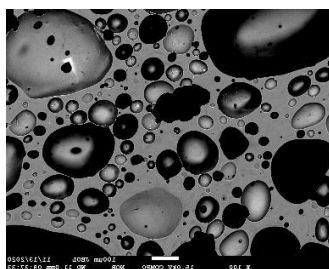
## APPENDIX 2

### Electron Probe Microanalysis EPMA (Norm%)

Sample	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5
Brown	66.58	1.12	14.21	5.55	0.19	1.13	3.05	5.25	2.61	0.31
Brown	66.12	1.21	14.15	5.87	0.21	1.10	3.11	5.24	2.66	0.34
Brown	66.42	1.22	14.34	5.48	0.20	1.10	3.10	5.17	2.68	0.28
Brown	66.08	1.14	14.31	5.95	0.20	1.15	3.10	5.13	2.71	0.24
Brown	66.47	1.15	14.41	5.77	0.20	1.19	3.01	4.89	2.66	0.27
Brown	66.60	1.25	14.41	5.65	0.18	1.15	3.04	4.83	2.64	0.25
Brown	66.38	1.15	14.63	5.72	0.22	1.10	3.08	4.87	2.65	0.20
Brown	66.73	1.08	14.51	5.45	0.21	1.04	3.03	5.09	2.65	0.22
Brown	66.40	1.25	14.23	5.79	0.23	1.17	3.22	4.85	2.54	0.33
Brown	66.52	1.11	14.69	5.54	0.16	1.08	3.09	4.87	2.72	0.21
Brown	66.66	1.14	14.34	5.50	0.19	1.11	2.98	5.15	2.64	0.29
Brown	66.83	1.15	14.50	5.69	0.18	1.09	2.98	4.70	2.60	0.28
Brown	67.32	1.15	14.44	5.22	0.21	0.98	2.82	4.94	2.65	0.27
Brown	66.51	1.22	14.38	5.73	0.19	1.11	3.12	4.86	2.60	0.29
Brown	66.47	1.21	14.50	5.36	0.15	1.06	2.96	5.37	2.75	0.17
Black	68.59	1.15	13.44	5.44	0.18	0.70	2.35	4.70	3.20	0.24
Black	69.05	1.16	13.89	5.23	0.18	0.72	2.47	3.98	2.97	0.35
Black	68.49	1.19	13.57	5.19	0.17	0.75	2.26	4.98	3.12	0.27
Black	69.43	0.84	13.73	5.21	0.19	0.66	1.94	4.50	3.22	0.28
Black	68.63	1.13	13.41	5.38	0.14	0.69	2.25	4.88	3.19	0.29
Black	68.66	1.17	13.54	5.36	0.17	0.72	2.39	4.54	3.19	0.26
Black	69.06	1.18	13.61	5.36	0.16	0.71	2.24	4.44	2.98	0.27
Black	68.53	1.16	13.35	5.38	0.19	0.82	2.39	4.72	3.19	0.29
Black	68.26	1.11	13.67	5.28	0.19	0.80	2.42	4.92	3.05	0.31
Black	67.94	1.02	14.80	5.00	0.14	0.75	2.79	4.80	2.55	0.21
Black	67.64	1.31	13.70	5.87	0.18	0.83	2.53	4.54	3.11	0.29
Black	67.84	1.31	13.46	5.79	0.18	0.79	2.48	4.60	3.19	0.37
Black	67.53	1.29	13.50	5.86	0.20	0.86	2.41	4.89	3.17	0.29
Black	67.79	1.25	13.46	5.79	0.15	0.86	2.59	4.71	3.07	0.33
Black	68.44	1.17	13.78	5.29	0.16	0.81	2.32	4.60	3.14	0.29



**Black Sample**



**Brown Sample**