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Last Reviewed: 2017

STATEMENT OF SIGNIFICANCE

BONAWE IRON FURNACE



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HISTORIC ENVIRONMENT SCOTLAND STATEMENT OF SIGNIFICANCE

BONAWE IRON FURNACE

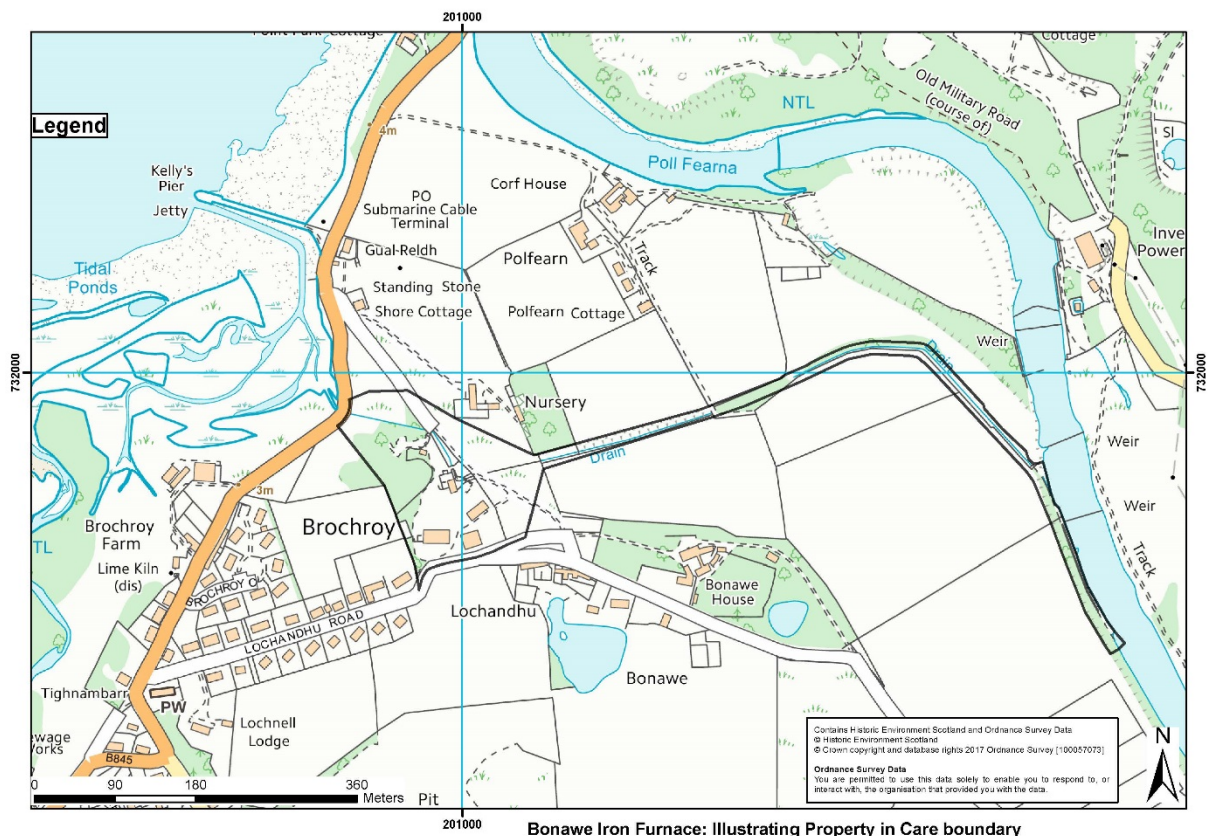
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I. SUMMARY

1.1 Introduction

Bonawe Iron Furnace stands on sloping ground close to the southern shore of Loch Etive and immediately north of the village of Taynuilt, in Argyll. The River Awe, which powered the furnace's bellows and blowing machine, passes by one kilometre to the east before entering the loch.



The property consists of the extensive and well-preserved remains of an 18th- century ironworks that was fuelled by charcoal throughout its entire existence. The buildings in the care of Historic Environment Scotland (HES) are stone-built, most with slate roofs, and set into the north-facing hill-slope so as to facilitate the movement of raw materials in what was essentially a gravity-fed process. They comprise:

- the furnace stack and charging house, together with their associated waterwheel pit, blowing house and casting house, all now ruined;
- two vast charcoal-storage sheds;
- a much smaller iron-ore shed;
- a ruined 'barkhouse';
- the lade(water course) and slag heaps.

Beyond the area in HES care are other buildings and structures important to the iron-making process. These include the company agent's house (Bonawe House) to the south-east; two blocks of workers' housing, to the south and north-east; and the quay (Lorn Quay) beside Loch Etive. The hills and glens surrounding the area in care are also of great significance due to their connection with charcoal burning, as well as the fact parts of the land were worked and crofted by local people who also worked at the furnace.

The site formally passed into State care in 1973. However, conservation work to the ruined structures began in the 1960s and was substantially completed by the time the Deed of Guardianship was formally signed. Archaeological excavations were carried out by Chris Tabraham in 1978-9 and 1982. The site was formally opened to visitors in 1984. As Frank Walker so tellingly writes: 'Carefully restored and presented to the public, their [ie, the furnace and shed buildings] monumental quietness, more ecclesiastical than industrial, cannot capture the productive energy that must have gripped Taynuilt for more than a hundred years'.¹

Today, the site is laid out with a recommended visitor's trail that begins at the little visitor centre (built beside the slagheaps in 1983 to house a small shop and toilets) and follows the raw materials on their journey through the process, from the storage-sheds at the south (upper) end of the site downhill via the charging house and furnace stack to the casting house. An exhibition, including historic artefacts, samples of the raw materials, architectural models and illustrations, is on display in part of the iron-ore shed.

The site opens to visitors only in the summer months. It attracted 2545 visitors in 2016. During the rest of the year, visitors may freely walk around the site.

The buildings beyond the area in State care are in private ownership and not normally accessible. The L-planned two-storey workers' housing to the north-east of the furnace is only partly inhabited for residential use and what remains unused is in extremely poor condition (2017).

1.2 Statement of Significance

- Bonawe Iron Furnace is the most complete charcoal-fired blast furnace in the British Isles. Not only do the furnace stack and its attendant structures survive almost complete, but so also the accompanying storage sheds, slag-heaps, lade, agent's residence, workers' housing and quay. (Note: not all of these are in HES care.)

¹ Walker, *Buildings of Scotland: Argyll and Bute*, 484-5.

- Bonawe was the longest-lived charcoal-fired blast furnace in Scotland, remaining in almost continuous production for over 120 years (1753-1876). When it finally ceased production, only one other charcoal-fired blast furnace remained in production in the British Isles. During that time there was little radical change in the production process, or in the design of the buildings themselves.
- Bonawe heralded the beginning of successful industrialisation in the Scottish Highlands.
- The architecture of the surviving buildings displays the company's Cumbrian roots.
- The ironworks provided an important source of temporary employment to some 600 Gaelic-speaking local people, mostly taken on as seasonal charcoal-burners. Although the original workforce at the furnace itself were incomers from Cumbria, these jobs too in time came to be filled by locals. The ethnological impact of such a sudden insurgence of English speakers into an entirely Gaelic speaking area is of significance and needs further research to be fully understood.
- The careful management of the extensive woodland (through a practice known as coppicing) resulted in the company's woods across Argyll being in as good a state at the end of the furnace's life as they were at the beginning.

2. ASSESSMENT OF VALUES

2.1 Background

Bonawe Iron Furnace is the most complete charcoal-fired blast furnace in the British Isles. However, not all of the buildings and associated structures are in HES care. Those that are comprise:

The furnace-stack and charging house (the latter also known as the 'bridge house').²

This is where the raw materials – iron (mostly haematite), charcoal (fuel) and limestone (flux to remove impurities from the ore) – were brought together to produce the finished product, chiefly in the form of pig iron but also including cannonballs. Although externally the furnace stack and charging house appear as one structure, measuring overall c. 8m by 4m,

² See reconstruction drawing of furnace structure in Hay and Stell, *Monuments of Industry* (1986), 113.

internally they are physically separated by a gap (2m wide at the level of the charging-house floor and tapering to less than 1m at the bottom) to prevent water seeping into the stack itself, thereby causing an explosion. (The gap was used also to provide temporary sleeping quarters for the furnace masters during the 24/7 blasting process). Much of the cobbled floor of the charging house remains *in situ* (this floor is a replacement for one which lies c. 700mm beneath). The fireclay steps up to the furnace mouth are probably 19th-century in date, indicating a repair or rebuilding; one of them is stamped LUCOOK.

The tapering furnace stack rises to 8.9m high (10.7m to the chimney top). It retains its two deeply-splayed, flat-topped openings, one facing north (the blowing arch) used for blasting cold air into the furnace and the other facing west (the tap arch), from where the molten iron was tapped. Both openings still retain their original cast-iron structural lintels, stamped with the inscriptions BUNAW. F. 1753 and NE. 175[3] (most likely for Newland, the name of the parent company, based in what was then North Lancashire, now Cumbria). Some of the furnace's cone-shaped inner lining survives, including firebricks stamped CWM BRAN FIRE CLAY CO, a firm operating in South Wales prior to 1850.³ However, the furnace stack now lacks its blow hole (tuyère), tap hole (tymp) and hearth. The upper part of the furnace stack shows evidence of having been heightened at some stage.

The wheel pit, blowing house and casting house.

These are now largely ruined structures. The stone-lined wheel pit, on the east side of the furnace, lacks its waterwheel, removed for scrap in 1941. The dimensions of the pit itself show that the wheel, probably of iron construction, was of the low breast-shot type and measured c. 3.7m in diameter and almost 2m wide. The little building beside the wheel pit was probably an office (perhaps the pay office). The blowing house, on the north side of the furnace, is also largely devoid of features other than the large granite blocks set into the floor on which was mounted the cast-iron blowing cylinder, which replaced the original bellows in the early 19th century. The casting house, on the west side of the furnace, is now represented only by stone footings, but its floor, on excavation, was found to be part-metalled (the working surface) and part-sand (in which the finished products were cast into moulds).⁴

Two vast charcoal storage-sheds.⁵

These have a combined storage capacity of over 2,000 cubic metres and are evidence of the huge amounts of charcoal consumed during the blasting process. Their monumental size can be described as 'cathedral-

³ RCAHMS *Lorn*, 284.

⁴ Lewis, 'Charcoal-fired blast furnaces', 467-70.

⁵ RCAHMS, *Lorn*, 288-9.

esque'. They are built into the steeply-sloping ground and have upper and lower doorways, for loading and emptying. Otherwise, they are largely devoid of features, except for square holes ranged around the inside walls that are presumed to be putlog holes for securing the storage racks. We know nothing about their arrangement other than that the charcoal was supplied in 1½ cwt (76kg) bags and stacked in dozens.⁶

Their constructional details, which display alien (Cumbrian) characteristics, are dealt with below (see *Architectural and Artistic Values*). The footings of a third charcoal shed lie beside the eastern shed. Interestingly, the eastern shed has a belfry on its back (south) gable, evidently an addition, in which hung the company bell, rung to denote the changing shifts and in emergencies. This shed was known by the local workers as Taigh a' Bhell (the Bell-house)

The smaller iron-ore storage shed.⁷

This single-storeyed structure, measuring c. 23m by 9m, stored the iron ore and also the limestone (the latter used to remove impurities from the ore during the smelting process). Its size, compared to the two vast charcoal sheds, is roughly indicative of the proportions of the two principal raw materials used. This structure is also built into the sloping bank and fitted with upper (loading) and lower (emptying) doorways. A covered gallery runs almost the entire length of its north-facing side. The four-compartmented interior is also devoid of features but the walls still retain the reddish stain from the haematite (iron ore) stored therein. (Note: the easternmost compartment, now housing the site exhibition, and gallery are clearly later additions.)

The lade.

This stone-lined artificial water-course brought water to the wheel from the River Awe 1km away to the east. Shortly before reaching the furnace, the water was channelled onto a timber launder, or trough (now gone), which turned it through 90 degrees and fed it directly onto the waterwheel. (When the water-level was low in the River Awe, two reservoirs south of Bonawe House provided an auxiliary supply through underground pipes.)

The slag heaps.

These mounds, characterised by the glassy appearance of the material, lie to the north-west of the casting house, in and around the area where the visitors' car-park is.

Other buildings.

In addition to the above, other structures evidently existed, but survive now as foundations only. One of them, immediately behind (south of) the

⁶ Hay and Stell, *Monuments of Industry*, 114.

⁷ RCAHMS, *Lorn*, 287-8.

iron-ore shed, was most probably another charcoal shed, whilst the long, narrow structure at the western edge of the site, may have been the 'barkhouse', where the bark, a by-product of charcoal-making, was stored prior to being sold to leather tanneries.

Structures outside the area in HES care.

These include most notably the company agent's house (Bonawe House), two blocks of workers' housing (a rectangular range comprising one-and-a-half storeys to the south of the furnace complex, and an L-shaped range comprising two-storeys to the north-east) and the company's quay (Lorn Quay), beside Loch Etive, where raw materials were landed and finished products loaded.⁸) Further afield are the remains of the charcoal industry that fuelled the iron-smelting process, most notably the coppiced woodland and charcoal-burning platforms in the forest of Glen Nant, to the south of Taynuilt.⁹

Bonawe Iron Furnace was in almost complete production for over 120 years, from its establishment in 1752/3 through to its final blast in 1876. During all that time it remained in the ownership and day-to-day control of one company, originally the Newland Company, set up in 1735 by Richard Ford, an entrepreneur from North Lancashire (now Cumbria) who owned iron-ore mines in the southern Lake District and operated two blast furnaces there, at Newland and Nibthwaite.¹⁰

Despite the length of time Bonawe was in blast, the buildings show little significant change in design. The furnace stack itself was heightened at some point, and the original blowing apparatus (two leather bellows) was replaced by a cast-iron blowing cylinder, probably in the early 19th century, but other than the regular relining of the furnace stack interior, required because of the enormous heat generated there, and other repairs for 'wear and tear', the heart of the complex seems to have remained much as it was built in the 1750s. Elsewhere, the iron-ore shed was clearly extended to the east at some point, whilst the eastern compartment of the eastern charcoal-shed was subsequently converted into what appears to have been a barrel store (perhaps for the ale consumed in vast quantities by the thirsty furnace workers).¹¹

2.2 Evidential values

There is considerable archaeological potential within and surrounding the area in HES care. There is also the potential to combine this with local

⁸ RCAHMS, *Lorn*, 291-2.

⁹ In addition to Glen Nant, other groupings of charcoal-burning platforms have been recorded around Loch Etive itself (see RCAHMS, *Lorn*, 281, nos.360 & 361)

¹⁰ See Fell, *Early Iron Industry of Furness and District*, 391

¹¹ Tabraham, *Bonawe Historic Iron Furnace*, 28.

historical knowledge which has been passed down orally and recorded from the Brigadier John MacFarlane whose great-grandmother worked in the barking shed at the furnace (see further details below).¹²

Archaeological excavations in 1978-9 and 1982 concentrated on the area immediately around the furnace-stack and charging house, as part of an exercise to present the property to visitors.¹³ Whilst large-scale, they were by no means comprehensive, and significant archaeological stratigraphy remains, in both the blowing house and casting house. Although excavation also took place in and to the south of the charging house, most of the surfaces here were only superficially investigated.

These excavations highlighted the fact, previously observed in the upstanding fabric, that the furnace had been modified during the course of its existence. In the blowing house, for example, the granite blocks supporting the replacement blowing cylinder were found, whilst the area between the blowing house and the casting house, originally open to the elements, was shown to have been subsequently built upon, to provide additional internal working space. However, the dearth of datable artefacts from the archaeological deposits made more refined dating of these changes impossible. The same applied to the addition of a verandah to the south gable of the charging house.

The potential for further archaeological research across the site remains high. For example, the discovery of four slate paths (probably barrow runs) between the iron-ore shed and the charging house demonstrates that further archaeological potential lies beneath the large expanses of grass. And although the upstanding roofed storage sheds appear to be archaeologically sterile, the two structures now surviving largely as foundations (the third charcoal shed and the putative 'barkhouse') remain largely undisturbed.

(NOTE: considerable archaeological potential remains beyond the area in HES care, within the Scheduled Ancient Monument, where the site of other buildings – including a church, school, inn and truck store – must exist, as well as the remains of domestic activity (eg, gardening) associated with the two blocks of workers' housing.)

The potential for future standing building archaeology seems limited, given the large-scale conservation works carried out by the Ministry of Public Building and Works, mostly in the 1960s. However, analysis of the comprehensive sets of drawings and photographs made then may provide further archaeological evidence.

¹² We are particularly indebted to the Brigadier John MacFarlane for talking to us and showing us around the areas connected with the furnace. His local insight and oral history of the furnace is invaluable.

¹³ See Lewis, 'Charcoal-Fired Blast Furnaces', 466-73.

2.3 Historical values

Bonawe is one of the most remarkable monuments of the early Industrial Revolution in Britain. It was established in 1752-3 by a company based in north-west England, who were keen to exploit new sources of woodland to provide the vast amounts of charcoal required. Bonawe represents the last of the 'old' technology, for even before it was built, a way had been found to smelt iron using coke as a fuel. Six years after Bonawe went into production, the mighty Carron Ironworks opened near Falkirk, the first in Scotland to use coke-fired furnaces. Despite this, Bonawe remained in blast for over 120 years, producing good-quality iron at competitive prices, thanks to the plentiful charcoal to be had from the thickly-wooded hills of Argyll.

The Cumbrian connection

Bonawe Iron Furnace was set up, and run throughout its 120-year existence, by a company based in what was then North Lancashire (now part of Cumbria). A shortage of charcoal in the southern Lake District attracted Richard Ford & Company to the rich woods of Argyllshire. Despite being 300 miles by sea from the parent ironworks at Newland, near Ulverston, the company found it more profitable to set up a subsidiary furnace here rather than transport the charcoal back to Cumbria. The decision proved a shrewd one as company records show that in 1780 Bonawe produced cast-iron for competitive prices.¹⁴

This Cumbrian connection is evident at the site today. One of the cast-iron lintels supporting the furnace arches bears the inscription 'NE.175(3)', most probably standing for Newland, where all six lintels were made, whilst the red sandstone slabs between the lintels are probably of West Cumbrian origin. The slate roofs on all the buildings are also of Cumbrian 'greenstone'. Even the 'Lord Nelson' plaque (now on display in the site exhibition) is made of Cumbrian 'greenstone'. (Note: the original sandstone lintels in the furnace stack and much of the Cumbrian slate were replaced by the Ministry of Public Building and Works in the 1960s). Other typically Lakeland constructional features are evident in the buildings (see *Architectural and Artistic Values* below).

Anglo-Gaelic relations

Bonawe Furnace was owned, managed and operated by Englishmen, at a time when the native population was almost exclusively composed of Gaels. Unfortunately, the historical record does not cast light on how the two communities interacted.¹⁵

¹⁴ Fell, *Early Iron Industry*, 396

¹⁵ Although the works was founded within eight years of the Battle of Culloden, it is doubtful if there was much lingering Jacobite resentment among the majority of

We do know that the workforce at the furnace itself, including their wives and families, comprised English-speaking incomers in a completely Gaelic environment. Only as time went on did the skilled and semi-skilled workforce at the furnace apparently include a growing number of local men.¹⁶

Also, although the core of the workforce were incomers (the furnace master and his men), much of the ‘coaling’ (charcoal production) was carried out by local people, taken on as seasonal workers to work in the woods the company leased from local landowners. Quite how this operation was organised is not evident from the available records.¹⁷

Information about the lives and conditions of the majority of people associated with Bonawe is very scarce as there are few documentary sources. Oral history can tell us about specific experiences and we do have information about one local worker at the furnace in the 19th century. This life-story, while it is of course particular to the individuals concerned, does touch on many important historical themes: the role of women, social custom, emigration and working life. Brigadier John MacFarlane shared the following details with us about his great-grandmother Flory MacLulich who worked as a bark peeler in the barking shed at Bonawe in the 1840s:

She was born a MacLulich which is an ancient name on Loch Awe-side, and connected with Baile Mhaodain which is an ancient church up behind Ardchattan Priory. Flory worked as a bark peeler at the furnace as a young girl of about 18, and possibly met her future husband Archibald at that time. There is no record of a marriage between her and her husband Archibald MacCallum; it would appear that theirs was possibly a handfast marriage. In any case Flory became pregnant. Archibald (John’s great-grandfather) went off before the birth of the child first to Co. Down, Ireland to work on the building of a granite Castle in Castle Welland before emigrating to Canada. Flory did not go with him and had to find work and money to pay for herself and her son who was born in 1851 (along with money being sent home from Canada). She moved into service, and her son was cared for by relatives in the surrounding area.

the local population, given that the ironworks was established in Campbell (ie, pro-Government) territory.

¹⁶ For example, a headstone in Muckairn graveyard, in Taynuilt, records the death of Duncan McCalman, most probably a local man, who is recorded as being ‘upwards of 30 years iron founder in Lorn Furnace’. Examination of census records, etc., might provide a fuller details.

¹⁷ It is possible that the company agent, resident at the works, dealt directly with the landowners’ factors, in which case evidence may be forthcoming in the archives of the landowners, including most importantly the Earls of Breadalbane and the Campbells of Lochnell, from whom the company leased most of its woods.

Eventually her husband rejoined the family in Muckairn towards the end of the 19th century and is buried in Muckairn Churchyard with his family. Between them they had built Tigh nam Barr on the hill above the furnace in Taynuilt, and Flory died in the house 1928. John MacFarlane said of his great-grandmother that she was a formidable woman.

Industrialisation of the Highlands

Bonawe Furnace was among the first industrial enterprises established in the Scottish Highlands. It was certainly the most successful of the numerous ironworks set up in the 18th century.

Iron production on a semi-industrial scale in the Highlands seems to have begun in c.1608 in north-west Ross-shire, around Loch Maree.

Documentary evidence for these early works (at Fasagh, Letterewe and the 'Red Smiddy', near Poolewe) is scant but the instigator of the scheme was probably Sir George Hay of Airdry, a Lowland Scot. The ventures seem to have been relatively short-lived, but later accounts refer to casting at 'Red Smiddy' in the 1660s.¹⁸

During the 1720s three more relatively well-known blast furnaces were set up in the Highlands - at Culnakyle, near Abernethy, in Speyside; Invergarry, beside Loch Oich, Inverness-shire; and Glenkinglass, beside upper Loch Etive and only eight miles from Bonawe. All were short-lived; Culnakyle lasted five years, Invergarry eight and Glenkinglass a total of 16 years.¹⁹ The significance of Glenkinglass for Bonawe is not just its proximity but the fact that Richard Ford and Company, who founded Bonawe, renegotiated timber contracts formerly held by Glenkinglass. The leases negotiated with the Earl of Breadalbane and Sir Duncan Campbell of Lochnell, both for the unusually long period of 110 years, ensured Bonawe's success.²⁰

Excavations at Glenkinglass in 1979 and 1981, in advance of river erosion, showed remarkable similarities to Bonawe, particularly the workings of the furnace itself, and suggested that the initial (temporary) storage sheds at Bonawe may also have been of timber, cruck-framed construction.²¹

Within a year or so of Bonawe going into blast, another ironworks was set up in Argyllshire, in the township of Inverlacken (since re-named Furnace), beside Loch Fyne. Known variously as Goatfield, Craleckan and Argyle Furnace, this too was a Cumbrian-based enterprise, the founders being the Duddon Company, north Millom. Second only to Bonawe in longevity of operations - it was in blast from 1755 to 1813 - its surviving structures

¹⁸ Dixon, *Gairloch*, 78-9 & 90-6; Lewis, 'Charcoal-fired blast furnaces', 435-7 & 440-5

¹⁹ See Lewis, 'Charcoal-fired blast furnaces', 437-8.

²⁰ Lindsay, 1977, 'Iron Industry in the Highlands', 60.

²¹ Lewis, 'Charcoal-fired blast furnaces', 445-64.

(furnace-stack and charging house and a charcoal shed) also share remarkable similarities with Bonawe.²²

Bonawe, Cannonballs and Lord Nelson

Bonawe was an ironworks, pure and simple, producing humble pig-iron for a market increasingly hungry for iron products. However, it does have one important association with an historically significant figure.

Bonawe Furnace's output was mostly pig-iron, which was shipped out from Lorn Quay. Bonawe, unusually, did not have a forge where pig-iron could be reworked into finished products for sale locally, eg, cast-iron firebacks (the one on display in the site exhibition was most probably cast at nearby Glenkinglass Ironworks).²³ Bonawe's pig-iron went mostly to the parent company's Newland operation but records show consignments. The length of pig-iron stamped LORN now displayed in the site exhibition is the only known surviving example.²⁴

The only finished products known to have been made at Bonawe were cast-iron cannonballs. In 1781 there is record of a shipment of '3 to 32 pounder round shot' via Newland to the Ordnance Office, Woolwich.²⁵ This was at a time when the War of American Independence was coming to its climax. A single cast-iron cannonball survives and is now on display in the site exhibition.²⁶

The production of cannonballs at Bonawe goes some way to explaining why the workforce were the first in Great Britain to erect a memorial to Admiral Lord Nelson, following his death at the Battle of Trafalgar on 21 October 1805. The workforce took a 3.5m-tall prehistoric standing stone from a field near Airds Bay and re-erected it on a hillock near Muckairn Parish Church, in Taynuilt.²⁷ The Cumbrian-slate plaque bearing the inscription 'To the memory of Lord Nelson this stone was erected [sic] by the Lorn Furnace workmen 1805' is now on display in the site exhibition.²⁸

The story of this event has been passed down locally through the generations and was told by John MacFarlane as follows:

There's another connection in the village: there's a mound beside the church which is called Cnoc Aingeal which means the hill of Sacrificial Fires, (it's got nothing to do with angels) and it's connected with the Furnace and with Lord Nelson. The

²² Hay and Stell, *Monuments of Industry*, 114-5; Lewis, 'Charcoal-fired blast furnaces', 438-9 & 473-6.

²³ The cast-iron fire-back was donated

²⁴ The length of pig-iron was donated by the Huntingdons, who entrusted the site into state care in 1973.

²⁵ Fell, *Early Iron Industry*, p245

²⁶ This too was donated by the Huntingdons (see note 20).

²⁷ Walker, *Argyll and Bute*, 487, and Hutton, G. *Old Taynuilt*. (2013), 2 & 23.

²⁸ Tabraham, C. *Bonawe Furnace*. (2008), 28-9. The plaque was donated in 1979 by a former minister of Muckairn Parish.

story starts with a very elemental force that dwells in Cruachan and she was called A' Chailleach Bheurr and she could take any form that she wished and one day she was in the form of a giant woman and she was walking down Glen Etive with one foot on each side of the loch and on her back she had a creel, and in the creel there was a great big megalith, a standing stone. When she reached Eilean Dhuirinnis which is the little peninsula just opposite where the ferry used to run across, she tripped on Eilean Dhuirinnis and the stone flew out and landed in a field called Mòine nan Carragh (the wasteland of the standing stones), near a farm called Brugh which is an underground dwelling. It fell on one side of a ridge which is there and that's called Druim nan Cabar in Gaelic which might refer to a woodhenge, and it's very near a well which is now well down beside the side of the road which is called Tobar nam Feusag, for what reason we don't know!

But it lay there and there was a ship from the furnace which had been down to Portsmouth delivering pig iron or maybe even cannon balls and she was in Falmouth when HMS Pickle the little schooner that brought the news of Trafalgar and the death of Nelson into Falmouth. So the ship was in Falmouth waiting for a favourable wind and they got the news. Obviously the news would go by semaphore up to London but this ship got a very fast passage up through the Irish Sea and came in and told the people here of the death of Nelson. They were so moved by things that immediately the iron masters and the local people went down to that field, picked up this great big megalith and carried it, rolled it up with horses and rollers to Cnoc Aingeal and struck a plate recording the death of Lord Nelson and put it on the stone. So that was there until WW2 when they were collecting iron - which was a psychological exercise that went on - and they took that away and there's an ugly lead version of it up there now but that's the connection. It's the first monument anywhere the United Kingdom dedicated to Nelson and the Royal Navy acknowledge that and at the 200th anniversary they had a huge parade up there with Royal Marine bands and all sorts.

Social history

The following aspects of the social history of the furnace have also been passed on by the Brigadier John MacFarlane (who is the last native speaker of Lorne Gaelic).

When the furnace started up the local people used to say it was like hell on earth, because at night for the first time in living memory the sky was red with light pollution from the furnace fires.

The furnace is associated with some of the prophecies of the Argyll Seer, Colla Chrosta. Firstly he predicted that wooden horses with canvas reins would come to the area and make a great difference. This was interpreted as the ships which came in through the narrows at Connel, carrying the ore for the furnace. Secondly he predicted that the area would change greatly when the two rivers the Awe and the Nant were joined. This happened when they dug a lade from the river Awe to the mouth of the Nant - the water came in from the Awe side and drove the machine in the pump house and came out onto the old line of the Nant.

Colla Chrosta also had a prophecy about Bonawe House, the agent's house which was 'Taigh Mòr Lochan an Cnàmh taigh gun sonas gun àgh, far nach cluinnear guth coilich no ruch leinibh gu bràth' (The big house of the loch of the bones, a house without happiness or joy, where no cockerel will ever be heard nor the sound of a child). The associated song and story are as follows.

There was a man in Kilchrennan who was in the militia in the 18thc, the Argyll militia and he went to Ireland with one of the units as many of them did. When he was over there he met a young girl and whose name was Màili or Molly and he was going out with her and her brothers objected because this was a protestant soldier from the mainland, redcoated soldier going out with a Catholic girl. They ambushed him when he was courting this girl in some remote spot - he drew his side arm to defend himself and the girl and as he took a swipe at one to the brothers he missed and hit the girl in the throat and she died on the spot and she died. He had a nervous breakdown and he composed a song which was a Mhàili Bhàn Òg (which is still sung today). He came back and he lived in the area of the furnace - he lived in the woods, lived on shellfish and stayed in the bothies they used for the shielings up behind the village. He was well known, he had a beautiful voice and he used to sing this song a Mhaili Bhan Òg. Some of the Irish workmen that were working on building the furnace buildings heard him singing and they recognised who he was as he had become infamous in Northern Ireland. They killed him and they buried him in the foundation of the house allegedly; so Taigh Mòr Lochan an Cnàmh taigh gun sonas gun àgh, it's a house without joy or happiness.

There are Gaelic place-names for parts of the furnace in and outwith the PIC area:

- Taigh a' Bhell: 'house of the bell' was the name given to one of the charcoal houses, where the bell was rung for the changing of the shifts.
- The pier is called Cidhe Cheallaidh or Kelly's Pier (Kelly was one of the managers there).
- The workers' houses were called Lochan Dubh (the black loch)
- Bonawe House was called 'Taigh Mòr Lochan nan Cnàmh' (the big house of the loch of the bones).

John MacFarlane also discussed the fact that while the furnace helped people in the area by providing employment and residual skills (like basket-making, tannery etc) it was also responsible for the demise of some villages nearby:

In Glen Lonan there's a deserted village called Barr Glas up on the slopes of Deagh Choimhead which is a little hill on the right hand side as you go through Glen Lonan to Oban. They were MacCalmans or MacCallums and they were known as the Rùsgain - the people who peeled bark. Now it's all covered with forestry but you can actually go into Barr Glas and see the tacksman's house and all the houses of the village and there's a great corn drying kiln there which is almost perfectly preserved and a path down to the river where they drew their water and everything and the rùsgain lived there and for many generations. The place was ancient woodland with lots of oak, and they used the bark to tan the leather and they had another operation just on the ridge where the railway station is now and that went out of business altogether because of the competition with the furnace.

When the furnace stopped some locals were able to use the skills they had learned from the furnace production to continue making an income, such as another relative of John MacFarlane's, Malcolm MacCallum (Calum a' ghual), who went into successful business selling 'sguabain' or brushes made of birch with a shaft of ash which had previously been made to clean the buildings at the furnace.²⁹

²⁹ Conversation with John MacFarlane, March 2017

Before the furnace buildings were taken into care apparently some of them were used as hen-houses which meant the hens in Taynuilt were always pink from scraping in the ash and haematite.³⁰

2.4 Architectural and artistic values

Detailed descriptions of the buildings (furnace-stack and charging house and storage sheds) are given above. Below are highlighted two of the site's architectural features that make it of especial interest.

Bonawe is the most complete charcoal-fired blast furnace in the British Isles. All the key components largely survive intact. These include the furnace itself, with its associated charging house, blowing house and casting house, the storage sheds for the raw materials, and the water system (wheel-pit, lade and reservoirs) that provided the power.

Other significant structures still stand around the factory complex. These include Bonawe House, built for the company's agent; two blocks of workers' housing; the company's pier, Lorn Quay, where raw materials, etc, were landed and products shipped out. (Note: none of these are in State care.)

In the hills and glens around are the woods of birch and oak that provided much of Bonawe's fuel, still with evidence of coppicing and remains of charcoal-burning platforms.

The only other surviving charcoal-blast furnace that approaches Bonawe's completeness is Duddon Bridge Ironworks, 4 miles north-north-east of Millom, Cumbria, which operated between 1736 and 1871. The upstanding remains there comprise the blast furnace and its adjacent buildings, an iron-ore shed and two charcoal sheds.³¹ However, none of the associated housing remains standing.

The single most important feature that Bonawe lacks is the furnace hearth, a feature also absent from Duddon Bridge. The sole-remaining furnace hearth surviving in Scotland is that at Craleckan (Argyle) Furnace, at Furnace, Loch Fyne, founded by the same company that built Duddon Bridge;³² it is assumed that the very last blast remains *in situ* there.

³⁰ Referred to by Anne Macfarlane in 1984, retrieved 12/2017, Tobar an Dualchais: <http://www.tobarandualchais.co.uk/en/fullrecord/47772/5>

³¹ Morton, G. R, 'The furnace at Duddon Bridge', *Journal of the Iron and Steel Institute*, 200 (1962), 444-52.

³² Hume, J. R, *The Industrial Archaeology of Scotland: 2. The Highlands and islands* (1977), 151; Hay & Stell, *Monuments of Industry*, 114-5; Lewis, 'Charcoal-fired blast furnaces', 473-6.

The basic building construction in itself is not unusual - mostly of local coursed rubble, chiefly granite, bound in lime mortar. However, certain details betray Cumbrian origins. The use of Cumbrian 'greenstone' slate for the roofs has already been commented on, as has the use of West Cumberland red sandstone for the blowing arch and tap arch. In addition, there are constructional details that would not normally be found in the Scottish Highlands. Typical Lakeland features include the slabstone drip-moulds that appear above some of the smaller windows and doorways, the practice of nailing the roofing slates onto narrow laths or battens in preference to the Scottish custom of fixing onto close-jointed sarking boards, and the vertically-hung slates covering the eaves fascias.

2.5 Landscape and aesthetic values

As mentioned above the immediate vicinity of the furnace today possesses a calm and peaceful quality which is in stark contrast to the atmosphere which would have existed when the furnace was in use. The surrounding landscape surrounding is of extremely high value both in terms of its rich place-name heritage connected with the furnace and the hills and glens which were used for charcoal-burning and social activities when the furnace was active.

Historic Scotland (HES' predecessor) organised an anniversary event at the furnace where they re-created a charcoal burning stand, giving a sense of the atmosphere and smell that would have surrounded the workers in the forest.

2.6 Natural heritage values

The area in care is not covered by any national designation for natural heritage value, however protected species such as bats and otters have been noted as present. The Ironworks site is adjacent to the Glen Nant Site of Specific Scientific Interest (SSSI) and National Nature Reserve (NNR). Bonawe was closely associated with the Glen Nant woodlands³³, which were managed to produce charcoal for the furnace in the 18th and 19th centuries.

Specifically relevant also are the areas of slag (e.g. at the car park site) which allow certain plant species to flourish for example Scentless mayweed Barren strawberry and Burnet Saxifrage

³³ the woodlands are managed by Forrest and Land Scotland; there are many walking trails and some excellent interpretation of the past management regimes including the charcoal stances [Glen Nant - Forestry and Land Scotland](#)

2.7 Contemporary/use values

The furnace is used by local groups for events and meetings from time to time, including use by the local drama group. There is a pride in the area and clearly more information to be gained from speaking to locals to collect more oral history.

3. MAJOR GAPS IN UNDERSTANDING

- What was the detailed history of the ironworks? Few company records appear to have survived, and scarcely anything is known about the operation of the works, particularly through the 19th century.
- What was the relationship between the Cumbrian parent company and the local Gaelic population, many of whom appear to have been employed, albeit on short-term contracts, in charcoal production and other work?
- What physical remains of the ironworks remain to be discovered? Although beyond the area formally in State care, the ground around contains equally important elements of the ironworks – the company agent’s house, workers’ housing and associated gardens, agriculture and grazing land, as well as the sites of the company’s church, school, inn and truck store. Scarcely anything is known about them, and a programme of research is long overdue. In particular an urgent investigation of any oral and social history is required.
- What more can be learned about the products made from Bonawe iron – what was the wider social and economic context, what were Bonawe’s key dependencies?

4. ASSOCIATED PROPERTIES

- Other Scottish charcoal-fired blast furnaces with some remains existing: Craleckan (Loch Fyne); Fasagh, near Inverewe; Glenkinglass (Loch Etive); Invergarry (Loch Oich); Red Smiddy (Poolewe), Tarrioch (Muirkirk)
- Cumbrian charcoal-fired blast furnaces with some remains existing: Backbarrow, Duddon, Newland and Nibthwaite.
- Other related sites:

- Glen Nant National Nature Reserve (3 miles south of Taynuilt) - coppicing and charcoal burning remains.
- Coalbrookdale (Shropshire) - where smelting with coke was discovered.

5. KEYWORDS

haematite (iron ore), charcoal, limestone, furnace, smelting, water power, coppicing, pig iron, cannonballs, industrialisation

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APPENDICES

APPENDIX I: TIMELINE

- **2nd millennium BC** iron is first made, in the Near East. It gradually replaces bronze (an alloy of copper and tin) as a metal for making tools and weapons
- **1st millennium BC** small-scale (domestic) iron production begins in Scotland. Small amounts of bog ore are heated in a charcoal fire to produce a soft spongy mass called a bloom, which is then taken to a forge and beaten, or wrought, into the required shape; hence wrought iron. The simple fire-pit later evolves into a larger, free-standing structure known as a bloomery.
- **15th century** the bloomery evolves into a much taller structure - the blast furnace - with a far greater blast of air and significantly higher temperatures (around 1200 degrees centigrade). This greatly increases output, but produces a different form of iron. Being far richer in carbon, it is much more liquid in form, and has to be run off, or cast, into prepared moulds; hence cast iron.
- **1500** the first blast furnaces appear in Britain, in the Weald of SE England, and slowly spreads elsewhere, including the Forest of Dean.
- **c. 1610** the first recorded attempt to establish a blast furnace in Scotland is made by Sir George Hay at A Cheardach Ruadh ('Red Smiddy'), near Poolewe, Wester Ross. The enterprise soon fails.
- **1709** Abraham Darby, furnace master at Coalbrookdale, in Shropshire, successfully produces cast iron using coke as the fuel rather than charcoal. The technology takes time to develop, and charcoal continues meantime as the fuel of choice.
- **1711** the first blast furnace in the southern Lake District is established at Backbarrow by two local entrepreneurs, William Rawlinson and John Machell.
- **1720s** three more Scottish blast furnaces are built: at (1) Invergarry, beside Loch Oich in Inverness-shire, by the Backbarrow Company with the landowner, John Macdonell of Invergarry; (2) Glenkinglass, beside Upper Loch Etive, Argyllshire, by an Irish partnership in tandem with the landowner, Sir Duncan Campbell of Lochnell, and (3) Culnakyle, in the forest of Abernethy, Speyside, founded by the York Buildings Company, of London. All three soon fail, due to a

combination of severe drought in the early 1730s and the economic slump of 1737/8.

- **c. 1732** the first recorded blast furnace in southern Scotland is built at Tarrloch near Muirkirk, in Ayrshire, probably by the earl of Cathcart
- **1754/5** the Cunsey Company opens a rival Argyllshire furnace at Inverlecken (later renamed Furnace), beside Loch Fyne. The works is variously known as the Goatfield, Craleckan and Argyle Furnace.
- **1759** the Carron Ironworks (Carron Company), near Falkirk, opens – the first in Scotland to use coke-fired technology. By 1800 it is the largest ironworks in Britain, employing 2,000 men.
- **1780** Bonawe's unit cost per ton of pig iron is cheaper than Newland's. Its output is stated to be around 700 tons of pig iron per year. This includes cannonballs, for in 1781 '3 to 32 pounder round shot' is shipped to the Ordnance Office, Woolwich, London.
- **1803** William and Dorothy Wordsworth, from Cumbria, visit Bonawe and stay with the company agent in Bonawe House.
- **1805** Bonawe's workforce erects a memorial to Lord Nelson (killed at Trafalgar) on a hillock beside Muckairn parish church, in Taynuilt. This is the first memorial to Nelson to be erected by public subscription in the UK.
- **1813** The ironworks at Furnace closes.
- **1828** James Beaumont Neilson, of Wilsontown Ironworks, Lanarkshire, patents the 'hot blast' technique, thereby enabling fuller use of low-grade coal and inferior blackband ironstone, more commonly found in Central Scotland. The days of the charcoal blast furnace are numbered.
- **1839** Bonawe produces 400 tons of pig iron, down by almost a half from its peak in the 1780s.
- **1846** Flory MacLulich works as a bark peeler at the furnace
- **1859** Duncan McCalman, 'upwards of 30 years iron founder in Lorn Furnace', is buried in Muckairn churchyard, Taynuilt; an indication that the core workforce has included local people for some time.
- **1863** the original 110-year lease runs out, and a new 21-year lease renegotiated.

- **1876** Bonawe finally closes. Only Newland and Backbarrow, both owned by the same company, now remain in blast.
- **1960s** The Ministry of Public Building & Works begins to conserve the buildings.
- **1973** Bonawe Iron Furnace is taken into State care.
- **1982** Carron Ironworks closes.
- **1983** a new ticket office is built among the slag heaps to the north of the site. It wins the Saltire Society Award for ‘best new building in the Scottish countryside’.
- **1984** Sir Magnus Magnusson, chair of the Ancient Monuments Board for Scotland, formally opens the newly conserved site to visitors.