

UNCOVERING THE HIDDEN HISTORY OF HIGGINS NEUK: AN ARCHAEOLOGICAL, DOCUMENTARY AND ENVIRONMENTAL INVESTIGATION OF A PALIMPSEST LANDSCAPE

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Summary

As part of the Inner Forth Landscape Initiative, an archaeological project was undertaken at the site of Higgins Neuk, adjacent to the south approach of the Clackmannanshire Bridge, at the mouth of the Pow Burn. The primary objective of the work was to test the hypothesis that this was the site of the royal dockyards built by James IV for the maintenance and fitting out of the ships of his navy during the Anglo-Scots wars, as suggested by historical research. Further, the project also aimed to characterise the industrial and maritime archaeology of this small area which is nevertheless broadly representative of the wider Inner Forth landscape and the history of human interaction with the river, exploitation of its resources and management of the environment. Features on the site include a mill and waterfront infrastructure associated with a ferry crossing. Techniques employed included coring, geophysics, metal detecting, topographic survey and excavation and all aspects of the work involved volunteers from the local community and further afield.

Introduction

Site location and description

The area of agricultural land on the south bank of the River Forth now known as Higgins Neuk is a palimpsest landscape, layer upon layer of history, representative of the wider Inner Forth. A meandering stream, the Pow Burn, is a tributary of the Forth and for hundreds of years its confluence with the Forth has formed the focal point of a range of industries and maritime activities. The complex interactions between the tidal influence of the Forth estuary, the effects of the burn and the impacts of human agency with changing patterns of land management, drainage and reclamation over several centuries, have created a dynamic landscape which continues to evolve.

The area of investigation comprises three fields of approximately 22 hectares which straddle the mouth of the Pow Burn to the east of the village of Airth, adjacent to the south approach of the Clackmannanshire Bridge and centred on NS 917 873 (Figure 1). The underlying geology is carse clay, estuarine deposits laid down by the Forth through the Holocene. In this area the current land surface had been formed by the Iron Age (Smith *et al* 2010). Abutting the estuary, a sea wall, stone-faced to the east and changing to an earth bank further west, defines the coast edge and forms the boundary between pasture and the unenclosed saltmarsh of the foreshore, which turns to intertidal mud flats towards the channel of the Forth. Across these three fields the modern coastline appears to have been largely formed by the middle Iron Age (Smith *et al* 2010). Elsewhere along the Forth, and in the areas immediately to the east and west of the site, significant post-medieval reclamation of the riverbank for agriculture has altered the shape of the coast edge, but this specific area appears to have always formed a small promontory jutting into the water.

Figure 1

The Pow Burn runs through this area, and a former meander, visible as a depression, follows the inside curve of the boundary of field 1 (presumably influencing its shape). A single-track road runs through the site, crossing the Pow Burn over a small stone bridge to continue west to Airth (Figure 1).

The project

Following 30 years of research which concluded that this area was the location of an early 16th century dockyard constructed by James IV (Reid 2002), John Reid approached The SCAPE Trust in 2013 to propose a project to investigate the landscape and attempt to uncover archaeological evidence of the docks. The development of the HLF-funded Inner Forth Landscape Initiative (IFLI) presented an ideal opportunity to undertake the research and a proposal was developed and submitted. IFLI's aims of working with local communities to enhance and promote the natural and cultural heritage of the Inner Forth landscape dovetailed well with SCAPE's remit of researching and celebrating the coastal archaeology of Scotland as well as the longstanding approach of engaging the public in doing so.

Over four seasons of fieldwork in October 2016, March 2017, October 2017 and May 2018, a range of techniques, including detailed topographic survey, landscape modelling, coring, metal detecting, geophysical survey and archaeological excavation were employed to investigate the site. Volunteers from the local community and further afield were involved in all aspects of the project, and several workshops and feedback events were held locally as part of the post-excavation work and in order to disseminate results to participants and more widely to the public.

Aims and objectives

Although the area's importance had first been highlighted due to its connection with the royal dockyards, research also revealed a number of other aspects of the site's history and development. Significant and varied maritime and industrial activities for which the Pow Burn has formed a focal point from the medieval period onwards, make Higgins Neuk an exemplar of the wider Inner Forth landscape and a range of human interactions with the river. The project therefore aimed to understand recent changes to the landscape, record the archaeological remains and engage the community with the process of environmental and archaeological investigation, in addition to sharing and celebrating the heritage of the area.

Background

History and the site

James IV came to the throne in 1488 following a rebellion against his widely-unpopular father James III, which culminated in the latter's death at Sauchieburn. This took place against a backdrop of longstanding tensions between Scotland and England. Despite truces and treaties, these had occasionally boiled over into open hostility; from border skirmishes to a naval attack along the Forth in 1481 when Blackness was burned and Scottish vessels captured, followed by the loss of both Berwick and Dunbar Castle to the English in 1482, the latter only recovered in 1486. The early years of James IV's reign, however, saw the tide turn generally in Scotland's favour in these clashes, with two attempted raids by England both culminating in victory and the capture of ships and captains. In contrast to his unpopular father, James IV was the embodiment of medieval kingship; while also

representing the spirit of the Renaissance. His chief investment, described as an 'obsession' was in the development of Scotland's royal navy (MacDougall 2015).

Not only would a strong naval presence safeguard Scottish merchant shipping and offer protection from the threat of further naval raids by England, it would raise the king's international prestige. During this period, maritime technology in northern Europe was undergoing a sea change, with the introduction of new construction techniques permitting the development of larger, faster and more manoeuvrable ships which were well-suited for naval warfare. The seafaring nations of Europe rapidly adopted the new style *carracks*, which acted as large floating platforms for heavy artillery, in order to establish dominance of the seas, effectively precipitating a 16th century naval arms race.

James began construction of a fleet, with the *Margaret* in 1502 followed by the *Great Michael*, started in 1507. The former, probably similar to England's slightly-later *Mary Rose*, was named after James' Queen. His 1503 marriage to Margaret Tudor, daughter of Henry VII, was intended to seal the aspirational "Treaty of Perpetual Peace" between the traditional enemies; although as it transpired, relations between the two deteriorated, culminating in Flodden in 1513 (MacDougall 2001). By contrast, Scottish relations with other European nations, particularly France, grew increasingly warm, as James procured assistance, materials and expertise in the form of two master shipwrights from Louis XII as well as from Scandinavia, Flanders, Spain and Portugal. The famous *Great Michael*, frequently called either the *Michael* or simply the *great ship* in contemporary records, is thought to have been the largest vessel in Europe when she was launched in 1512, her build time of five years probably a reflection of her size and complexity. Representing a watershed in maritime technology, she was the first ship built in the British Isles designed to carry heavy artillery and her launch provoked a response from other European monarchs to keep up (MacDougall 1991; Osborne & Armstrong 2007).

Although the *Margaret* had been built at Leith, issues with the location caused difficulties at her launch, prompting the creation of a new dockyard for the construction of the *Michael*. Slightly to the west, Newhaven was established in 1504. A small chapel in the village was dedicated in 1507, the same year the keel of the *Michael* was laid, attesting to the permanence of the settlement. However, this new site remained vulnerable to attack, lying downstream of the fortifications on Inchgarvie and the narrows at Queensferry (Figure 1). A second dockyard was ordered by the king and established at the Pool (or Pow) of Airth, opposite Kincardine on Forth.

In addition to its more defensible location, the Pow of Airth, was attractive for a number of reasons; it was already an established harbour, first recorded in the 14th century. It was close to the royal forest of Torwood, a source of timber. Furthermore, the land was already in the hands of the crown, and adjacent to land held by the king's close retainer Lord Elphinstone, who was entrusted with much of the administration and management of the docks' construction (Reid 2002).

The scale of the Airth dockyard, and its importance to the crown, is illustrated by the extent of royal investment, detailed in the Treasurers Accounts and Exchequer Rolls. The site is first mentioned in 1506 with a payment made for the excavation of docks (Exchequer Rolls of Scotland, ii 342; iii 332), followed by expenses for the construction of stables (TA iii, 296) and further docks, including one specifically for the *Michael* in 1512 (TA iv, 280). A number of references are made to the presence of the ships there, firstly the *Margaret* for maintenance (TA iii, 296) in 1506-8 and again in 1512, and also to costs of keeping a number of ships in 1512-13 (TA iv, 444). The presence of key players in the

development of the navy; Captain Robert Barton (TA iii, 104-120) and the French shipwright Jacques Terrell, at Airth (TA iv, 131), as well as a number of visits by the king who took a personal interest in his navy, further attest to the site's importance. Additionally, quantities of timber are recorded as being sent to Airth, as well as generous provisions for the ships (TA iv, 104; 458; 281). Although the hulls were constructed at Newhaven, the quantities of wood sent to Airth suggest that parts of the superstructures may have been constructed there, and it is likely that activities were focused on fitting out as well as repairs and maintenance. Both the *Margaret* and the *Michael*, as well as a third ship, the *James*, are recorded as being at Airth in 1512 (MacDougall 2015, 236) with a flurry of activity that winter, as cross-border tensions grew, revealing the preparations for the war which ended at Flodden.

Following the defeat and the death of the king, all naval activity came to an abrupt end, the dockyard ceased functioning, and the location was effectively lost. However, Higgins Neuk was pinpointed as the site of the docks by extensive historic research (Reid 2002). Although now known as the Pow Burn, this watercourse, the focal point of the dockyard activity, was originally known as the Pow of Airth. The late-16th century map drawn by Timothy Pont (Pont 32, The East Central Lowlands) depicts the Pow's course beneath Airth Castle, and three ships at its mouth, the only port in Scotland to be distinguished by the depiction of vessels. Further documentary evidence relates more recent place-names to land called 'Docks' in the later 16th century. Associated with a landowner Patrik Hagins, the charters and sasines locate this land specifically in the Halls of Airth, a tract of Crown land of which the Pow Burn formed the north boundary. The name Docks continues into the 19th century, and becomes synonymous with Newmiln / Newmill. This small estate also gives its name to the area and is depicted on General Roy's 1740s survey, which also names the area immediately to the south *Higgins Neuk*.

Other features on site

The name Newmill implies the existence of a mill on the shore here, and this is first attested in a 1597 grant to the Bruce family of Airth for the construction of a mill (as well a saltpan) on the site (Register of the Great Seal of Scotland vi, 634). The name New Milne and a definitive record of a mill here appear in a charter of 1654 (Register of Sasines, RS58/9 f.254), while a 1621 charter refers in passing to the 'new mill of... Patrick Hegins' (Register of the Great Seal of Scotland viii, 1022). A mill remained in use until the mid-19th century, when it was described as partially ruinous, with half occupied as a cothouse.

This mill, on the narrow spit of land between the former meander and the Forth, apparently harnessed the water of the Pow Burn as well as tidal water from the Forth (Figure 2). At the south end of the meander, an artificial channel dug across its neck, straightening the line of the burn and isolating the loop, is depicted on a map of 1784 (National Records of Scotland RHP80865) and appears to have served to transform it into a mill pond. With the addition of raised embankments and a sluice at the junction with the burn, this would have formed a reservoir with the capacity to retain freshwater flowing down the burn. At the northern end of the loop, a culvert carried the water under the road to the site of the mill, presumably then draining into the Forth. Water from the Forth at high tide may also have been permitted to flow up this channel to be held in the reservoir, turning this into a tidal mill.

A second mill was constructed on the Pow Burn, probably as early as the late 17th century when the name changed from Newmill to Newmills. A second structure is depicted on historic maps just to the southeast of the earlier buildings, called New Mill on the 1st edition OS map (1865).

A ferry crossed the river Forth from here to Kincardine, and is first recorded in 1330, when it is described as the 'Ferry of Airth' (Exchequer Rolls I, 326). Multiple references from the 15th century onwards mention the problem of siltation. It is later depicted at Higgins Neuk on the 1784 map (National Records of Scotland RHP80865). A subsequent plan of 1828 (National Records of Scotland RHP4298) shows that south dock of the ferry has moved slightly east from Higgins Neuk, although the redundant infrastructure is depicted as a structure, labelled 'Old Stone Pier', and a notation 'Line of Old Wooden Pier' (Figure 2). The importance of this ferry crossing was partly due to its location on the main drove road from the northeast of Scotland to the Falkirk Tryst, which from the mid-18th century was the biggest cattle fair in Scotland. The Kincardine-Higgins Neuk ferry, along with Alloa slightly to the west were the two natural crossing points on the Forth for the cattle from the northeast of Scotland, though the high rates costs for ferrying black cattle at Alloa prompted complaints in 1827 (Haldane 2008).

Figure 2

The use of this area as a harbour into the 18th century is attested by an advertisement in the *Edinburgh Evening Courant* in 1757 which describes Newmills as a "safe and convenient harbour" for ships of up to 200 tons. For comparison, the *Margaret* was around 500 tons, and the *Great Michael* is believed to have been c. 1000 tons (Osborne & Armstrong 2007). The advertisement also mentions a girnel which could hold 2,500 bolls of grain. The Old Statistical Account for the parish of Airth also mentions Newmiln as one of three harbours in the parish, with occasional boatbuilding there (Sinclair 1792, 489).

Given the well-documented problems that the accretion of sediment caused for the ferry, it is possible that the mill lade channel which ran from the former meander of the Pow Burn also operated as a sluice for the harbour and pier.

Fieldwork

Methodology

The landscape of the Inner Forth has changed substantially over the past centuries, with changing sea levels and significant land reclamation dramatically altering much of the coastline. In order to understand the medieval and industrial landscape and inform decisions about where to excavate in search of the dockyards, a programme of coring was undertaken by teams of volunteers after training and under supervision of Richard Tipping, David Smith and Jason Jordan. Firstly, this showed that the carse clay here had been formed by the Forth in the later prehistoric period and that the coast edge had been largely unchanged here long prior to the period of interest, confirming that it was a feasible location for a dockyard in the early 16th century. Investigation initially focused on a semi-circular embayment in field 2 (Figure 1), now behind the sea wall, but significantly lower than the surrounding land. However, the results here did not show evidence of any deliberate excavation or alteration for the creation of docks. Focus shifted to the intertidal area in front of the known location of the mill and ferry. Coring targeted the Old Stone Pier depicted on historic maps (Figure 2) and identified a structure buried in the saltmarsh, projecting c. 40m towards the Forth and gently

sloping from a depth of c. 0.2m in front of the sea wall to c. 2.4m at its furthest seaward extent (Figure 3). Three peat samples recovered from the top of the structure yielded prehistoric radiocarbon dates: these are interpreted as redeposited peat which was washed down the River Forth during the reclamation of Stirling Mosses in the 18th and 19th centuries (Smout & Stewart 2012).

Figure 3

Metal detecting was also undertaken, which recovered mostly 19-20th century ironwork, although iron spikes and copper nails possibly indicate boat building activity. Additionally, the survey revealed metal finds on a buried mortar floor and nearby, a hardy tool fitting for an anvil, suggesting that ironworking activity had been carried out on site.

A drone survey was carried out across the entire area of interest, and a 3D model of the landscape was created from the photos taken (Figures 1, 2). The tidal range was then mapped against this to examine how the area would have flooded at high tide prior to the construction of the sea wall or the road, which has been partly built on a causeway (Figure 1). This showed that field 1 and the area of the meander would have flooded at high tide, and could thus have functioned as a tidal basin or dock where large ships could have been brought in for work (Figures 4, 5).

Figure 4

Figure 5

Geophysical survey was also undertaken, firstly an electromagnetic survey by Richard Bates of University of St Andrews across the entire area, and subsequently a resistivity survey by Edinburgh Archaeological Field Society targeting smaller areas which the earlier work identified as potentially of interest. Both surveys showed possible buried features in several areas, particularly the site of the mill and area adjacent to the Old Stone Pier. This area had also been covered by a topographic survey by John Reid and Allan Meek in 1984, which appeared to show the foundations of several buildings (Figure 6). It was thought that structures depicted in this area on 18th century maps were likely to have been sited here to take advantage of earlier infrastructure, and so it was decided to target this area for excavation, which took place over two weeks starting in September 2017 with a second season of 10 days in April-May 2018 (Figure 7).

Figure 6

Figure 7

Results

The mill area

The eastern end of the trench was positioned to investigate the mill which had been identified on historic maps. Excavation revealed a number of structures and associated features, including the very truncated remains of the mill building, the mill lade and a corn drying kiln (Figures 7, 8, 9, 10).

Corn drying kiln (Figure 8)

The uppermost feature was a rough cobbled surface of Victorian date, which appears to have been well-used, with several areas of patching and repairs. Underneath the cobbles, a brick hearth

associated with a curving stone wall was identified. It was revealed to be the northern half of a circular corn-drying kiln, (the southern side continued beyond the edge of the excavated area and under the road).

The upper part of the kiln has been demolished and robbed, and a deposit of glass bottles adjacent to the northern arc of the structure may be associated with this robbing event. The kiln was built into a hole dug into the natural clay, with well-built walls over 1m thick enclosing the bowl. The wall was faced with dressed stone on the inner and outer faces and had a rubble core. The flue on the west side was originally made of stone and later modified with the insertion of a brick flue. The iron grate associated with this phase of the flue remained in situ.

The collapsed drying floor above the bowl of the kiln had been constructed of specially-made square clay tiles with small holes to allow warm air to circulate. Underneath the collapsed tiles, layers of sediment and brick dust within the kiln bowl had also incorporated deposits of burnt grain which have trickled through the holes in the tiles. Although these have not yet been fully analysed, rapid assessment suggests that some of the grains had sprouted, suggesting that the structure may have been used for malting as part of a brewing process, as well as drying grain prior to grinding in the mill.

A sloping ramp with a rough cobbled surface provided access, to the flue from the west and a short length of straight walling on the north side of the flue was added later and formed a shelter wall. Immediately to the west of the kiln, underneath the cobbled layer, are deep deposits of raked-out ash. At least two linear trenches have cut through these deposits in front of the flue, presumably to facilitate the flow of air to the fire. The dumps of kiln waste have filled and levelled the slope on the east side of the channel which formed the mill lade.

Figure 8

Mill lade (Figures 9, 10)

This wide channel may originally have been cut to direct water from the former meander of the Pow Burn to sluice the harbour and ferry landing and later repurposed as a mill lade; or it may have been a natural channel which has been substantially modified for these purposes. Unfortunately, due to the water table, the flow of water from the former meander, and flooding of the channel from the Forth at every high tide, it was impossible to investigate it fully. The upper fill contained large quantities of late 19th-early 20th century material, indicating that it had remained open long after it ceased to function as a lade. Deep deposits of chaff have accumulated on the west side of the channel. Given that this would have impeded the functioning of the channel as a lade, this presumably represents later dumping into the then-redundant watercourse, after the mill had gone out of use.

The east side of the channel originally sloped gently westward and has been modified with the insertion of a stone retaining wall to straighten the bank (Figures 9, 10). A recess in this wall contains a timber structure with iron fittings, possibly one side of a sluice gate (Figure 9). The sloping bank between the wall and the corn drying kiln had been levelled with dumps of raked out material from the kiln. A small exploratory trench was excavated behind the stone wall and below the layers of rake-out from the kiln was a smear of mortar possibly associated with the construction of the retaining wall. Underlying this, waterlogged deposits appeared to have been formed of naturally

accumulated silt laid down by the action of the water. These contained a significant quantity of wood offcuts with tool marks, indicating that wood working had been undertaken in this channel prior to the construction of the retaining wall.

Figure 9

Figure 10

The west side of the channel has been badly damaged by robbing activity, but the sloping clay bank had been recut and straightened, perhaps to take the insertion of another, now partly robbed stone wall. All that survives is a single large square stone block, laid flat at the side of the channel, which represents the foundations of the robbed wall. This modification of the bank, in combination with the map evidence for the mill itself being located here, suggests that this may be engineering for the channel to function as a lade, or may be the badly damaged remains of the setting for the mill wheel at the side of the channel. This is partly suggested by the area opposite the alcove housing the timber feature. Although no structure survives, the plan of the west side of the channel mirrors the east, suggesting that it may originally have been modified with a similar recessed revetment wall containing a counterpart timber structure.

Remains of the mill structure

Although the historic map evidence indicated that the mill itself was located on the west side of the channel, excavation revealed the area to have been largely robbed out and badly truncated by later clearance, leaving a deposit of stone, brick and mortar rubble, which across most of this area sat directly on top of the natural clay. A line of three stone slabs running at right angles from the west side of the channel appears to have formed a pad. This, along with three stones around 3.5m to the west of this, which may represent the lowest course of a very damaged stone wall. Associated with this was a patch of paving which included a repurposed millstone (Figure 11). This surface appears to have formed an external yard or access from the road to the mill building.

Figure 11

Sea wall and ferry (Figure 12)

The entire area of investigation was enclosed by a stone sea wall. Further west in field 2, in front of the semi-circular embayment, the construction material for the bank changes from stone to earth (Figure 1). The sea wall was investigated on both the landward and seaward sides and excavation showed that the wall was built against the natural bank of the estuary after it had been cut back and straightened. Excavation on the landward side revealed stone packing and a clay bank behind the sea wall, with small patches of rough cobbling and metalling forming an irregular surface above. Trenches excavated against the face of the wall showed it extended to a depth of c. 2.2m from the top, and the good face exposed on the seaward side indicated that it was constructed prior to the formation of the saltmarsh. The wall would originally have had tidal waters coming up to the face.

Although several test pits were dug in the salt marsh in front of the wall to investigate the outflow of the mill lade, no evidence was found of any culvert to allow the discharge of water. It is therefore uncertain whether the outflow lies in an unexcavated area, or if the construction of the sea wall blocked the channel off from the Forth completely, which would suggest that the mill was out of use by the time the sea wall was constructed.

As well as formalising and straightening the bank, the sea wall may have been intended to stabilise the coast edge here, to prevent erosion, and was likely associated with the ferry crossing. Ironically, if the construction of the wall blocked the outflow of the mill lade, it would have prevented sluicing action and probably almost immediately impeded the ferry by encouraging siltation and the formation of the saltmarsh which was bemoaned by users of the ferry during the 18th and 19th centuries. It appears that the wall was rapidly buried by the saltmarsh, and chaff was found within the silts which accumulated against the sea wall, together with rubble which had collapsed from the structure. This demonstrates that some milling activities continued in the vicinity after the wall had fallen into disrepair (Figure 12).

Figure 12

Stone pier (Figures 13, 14)

The western end of the trench was positioned to investigate the area of landfall of the old stone pier depicted on historic maps. Coring had confirmed the presence of a sloping stone structure c. 5m wide and almost 40m long projecting from the sea wall into the saltmarsh. The stone sea wall dips for c. 15m in the area of the pier, and excavation revealed a cobbled access track which joined the pier to the road.

The track was not at a right angle to the coast edge, but approached it at a slight angle, pointing downstream. The surface of the track closest to the road is formed of rounded cobbles and incorporates occasional fragments of brick and slag. Small linear indentations running along its length appear to be wheel ruts. Excavation revealed the latest phase of the track, which had been laid as a replacement surface on top of earlier, very worn out, cobbles. The construction of the surface changes to rectangular sandstone blocks laid on edge and set in parallel lines approximately 5m behind the line of the sea wall. The reason for the change in construction material was explained during a very high spring tide during the October 2017 fieldwork (Figure 5) when the high water reached the top of the sandstone blocks. It appears that the change in construction techniques was deliberately positioned at the top of the intertidal zone, perhaps to facilitate runoff of the tidal water from the surface (Figure 13).

Figure 13

The landward end of the pier was exposed, with a surface of rounded paving slabs built with a slight camber, over and across the gap in the sea wall. The pier structure itself continued the downstream alignment of the trackway, running seawards for a further c. 40m.

Small test pits dug at the interface of the pier and the sea wall showed that the edging stone forming the seaward face of the pier was constructed of three courses of well-dressed ashlar blocks laid on top of a pine plank, radiocarbon dated to younger than around 1800. The stones of the top course have finely dressed faces, but differences in the tooling suggest that they may be reused stones. This probably represents a later re-facing and widening of the earlier pier structure (Figure 14), and the facing stones were seen to be butting against (and therefore later) than the sea wall.

Figure 14

Wooden pier

A small test pit was excavated to examine the line of the 'Old Wooden Pier' depicted on the 1828 map (National Records of Scotland RHP4298; Figure 2). Three wooden posts visible in the surface of the saltmarsh along this alignment were thought to be the remnants of this structure, and a further three substantial timber posts were revealed in the test pit. One was submitted for radiocarbon dating and was found to be of probable 18th century date.

Discussion

The investigations at Higgins Neuk have uncovered a complex maritime and industrial landscape which has evolved and undergone several substantial alterations.

The first phase of activity detected during the excavation appears to relate to the channel which later acted as a mill lade and possibly also as a sluice. This may originally have been a natural channel which has been significantly modified, probably at the same period as the construction of the corn drying kiln and the mill itself. A putative earlier use of the channel remains a possibility, though unproven.

Although no evidence was found in the construction of the sea wall for the outflow of the mill lade, the flooding of the channel from the seaward side at high tide attests to the existence of a culvert or conduit through the wall now buried in the saltmarsh.

The sea wall, and associated ferry piers are only the latest phase of ferry infrastructure here. Works associated with the earlier phases of the ferry may be buried in the saltmarsh elsewhere in the vicinity, or underlie these features or have been destroyed by the later construction. The two piers appear to be broadly contemporary in date, which may be explained by a 19th century reference to the ferry which mentions that three piers were built on this site in a very short period of time (Transactions of the Highland and Agricultural Society of Scotland, 1839, xii, 489-501) because of problems with the accumulation of mud. The later re-facing of the stone pier, widening the pier and slightly altering its alignment, may relate to an attempt to manage the siltation problem, while the mid-19th century end date of the mill here may have exacerbated the problem by stopping the sluicing action of the lade.

The saltmarsh appears to have formed rapidly through the 19th century, illustrated by the build-up of chaff which both contributed further to the sediment in the system and indicates the depositional environment in the water against the sea wall and pier. The sea wall fell into disrepair as the saltmarsh formed against it, illustrating the lack of maintenance in the area and probably related to the early-19th century move of the ferry terminal from Higgins Neuk to its later location slightly to the east, beneath the present position of the south end of the Kincardine Bridge. This eventual abandonment of Higgins Neuk in favour of the new site was due to the issue of sedimentation after almost 500 years of complaints about the problem.

Conclusion

Although the project has not located definitive evidence of the dockyards in the area of investigation, the results have informed our understanding of the landscape. They have led to the suggestion that several of the features, particularly the mill lade channel, may be related to the

dockyards and have been subsequently altered for the mill and ferry, leaving a number of avenues for future investigation. One suggestion is that the docks themselves lie within field 1 and that the former meander of the Pow Burn could have formed a tidal basin and functioned as a dry dock, with the mill lade channel possibly forming an entrance. Further work on the site may reward investigation in this area.

Furthermore, the work has uncovered a number of industrial and maritime features which are broadly representative of the history of human interaction with the River Forth and illustrate the evolution of this landscape. The interest within the local community has been demonstrated by the extent of volunteer participation in the project and engagement through talks, walks and site open days (Figure 15). An on-site interpretation panel will share the results with visitors, while the increased awareness of the hidden and previously largely-unknown heritage of Higgins Neuk will form a lasting legacy for the area.

Figure 15

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Maps

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Figures and captions

Figure 1. Site location map and plan. Base map © Maproom at www.maproom.net. 1:25 000 Scale Colour Raster [TIFF geospatial data], Scale 1:25000, Tiles: ns98, Updated: 14 August 2015, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, <<http://digimap.edina.ac.uk>>, Downloaded: 2016-01-14 15:22:10.809.

Figure 2. Features and structures depicted on historic maps located on the modern landscape survey.

Figure 3. The Old Stone Pier buried in the saltmarsh as defined by coring, showing locations of redeposited peat recovered from its surface.

Figure 4. The landscape model mapped against low tide (a) and high tide (b) showing the areas that would have flooded prior to the construction of the sea wall and causewayed road.

Figure 5. Aerial photograph of the site during excavation at high tide.

Figure 6. 1984 survey of the mill area by John Reid and Allan Meek.

Figure 7. Drone photograph of the excavated area showing main features identified (May 2018).

Figure 8. Drone photograph of east area of the site showing the corn drying kiln

Figure 9. The timber structure with iron fittings, possible sluice gate setting, housed in a recess of the retaining wall on the east side of the lade.

Figure 10. Drone photograph of the mill lade area showing the modified sloping banks, inserted wall on the east side, robbed face on the west side and truncated remains of mill structure to west.

Figure 11. The reused millstone in a paved surface.

Figure 12. Section dug against face of sea wall within saltmarsh showing accumulated sediment containing chaff and rubble from wall.

Figure 13. The access road and landward end of the stone pier.

Figure 14. The elevation and facing stones on the east side of the Old Stone Pier.

Figure 15. The site under excavation during an open day tour.