MORECAMBE BAY PARTNERSHIP

Headlands to Headspace

Jenny Brown's Point Archaeological Survey 2014-2016

Land off Lindeth Road
Silverdale
Lancashire

October 2017

Report Information

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Image on front cover: Volunteers surveying the remains at Site 2, Jenny Brown's Point during July 2015.

Acknowledgements

The work undertaken as part of the Headlands to Headspace Landscape Partnership Scheme would not have been possible without generous funding granted by the Heritage Lottery Fund.

The assistance of the landowners in granting permission to undertake work at the sites is very gratefully acknowledged, as well as the advice provided from Natural England/RSPB in obtaining SSSI consent.

The on going support and assistance from the Arnside and Silverdale AONB, Silverdale Parish Council Partnership, Megan Clement and Andy Sherman (CITiZAN North), Peter Iles (Lancashire Archaeology Advisory Service, formally Lancashire County Council), Sue Stallibrass (Historic England) and the local residents of Brown's Houses is very much appreciated.

The majority of the work outlined in this report could not have been achieved without the motivation and determination of a dedicated group of volunteers, who have helped research the historical background and undertaken survey at the site. All volunteers who have participated in this programme of training/project are acknowledged, however special thanks is afforded to Simon Williams, the driving force behind this project, alongside Claire Asplin, Andrew Davidson, Nerina Diaz, Andy Pringle, Dawn Sharples, Sue Hunter, Sarah Fishwick, Ser-Huang Poon, Sue Premu, Keith Parnell, and Jim Ferguson who have contributed to much of the information contained

within this report. Many of these volunteers have contributed hundreds of hours of their time to this project, working long hours pondering through historical documents, newspaper records, publications and working rain and shine to complete the on site recording.

Special thanks is also extended to David Cranstone, Ken Howarth, Rod Ireland, Max Moseley and Mark Simpson who have provided invaluable guidance and specialist advice on the local area, mining and industrial processes and shared their thoughts on the site.

Report Summary

This report details the results of historical research and on site survey undertaken as part of the Heritage Lottery Funded Headlands to Headspace Scheme. It focuses on two known sites of archaeological interest in the vicinity of Jenny Brown's Point, near Silverdale, Lancashire. The report presents an overview of the historical background, compiled as part of a volunteer training programme, as well as the results of a professional aerial photographic survey and volunteer tape and offset survey.

Site 1 comprises the stone rubble remains of a late 19th century failed land reclamation scheme (Site 1A), a large stone quay (Site 2B) and the vestiges of a brick and concrete structure, which suggest use in the 20th century for military installations.

Site 2 is focused on the area surrounding the Grade II Listed chimney (Site 2A) which is most commonly interpreted as a late 18th century copper smelter. The history of the chimney site is discussed in detail, exploring the various alternative theories for its function. To the east of the chimney the remains of wall foundations and a hearth (Site 2B) are becoming visible as the saltmarsh erodes in this area. These foundations appear to be associated with the chimney and volunteers surveyed the remains as part of this project, with the results of this work described.

Recommendations are provided on where research could be taken forward, both as part of the Headlands to Headspace Scheme and through continuous recording at the site as more features are exposed with the expected continued erosion of the saltmarsh in this area.

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1 Introduction

1.1 As part Headlands to Headspace Landscape Partnership Scheme (H2H) currently being delivered by Morecambe Bay Partnership, two heritage sites near Jenny Brown's Point, Silverdale have been subject to initial archaeological survey/investigation. A scoping study (Appendix 1) was produced by Morecambe Bay Partnership in 2014 to be used as a consultation tool and outline possibilities for the sites.

1.2 This document outlines the results of initial site visits in 2014 and initial survey work undertaken during 2015-6. It presents proposals for the continuation of investigations during 2017-8 and has served to support gaining landowner consent and liaise with organisations including Historic England, Natural England and Lancashire Archaeology Advisory Service.

2 Site Location and Description

2.1 Jenny Brown's Point is situated c.1.5km to the south of the village of Silverdale, *c.*3.8km to the north-west of Warton and *c.*14km to the north of Lancaster (SD 4460000, 3734480; Figures 1 and 2).

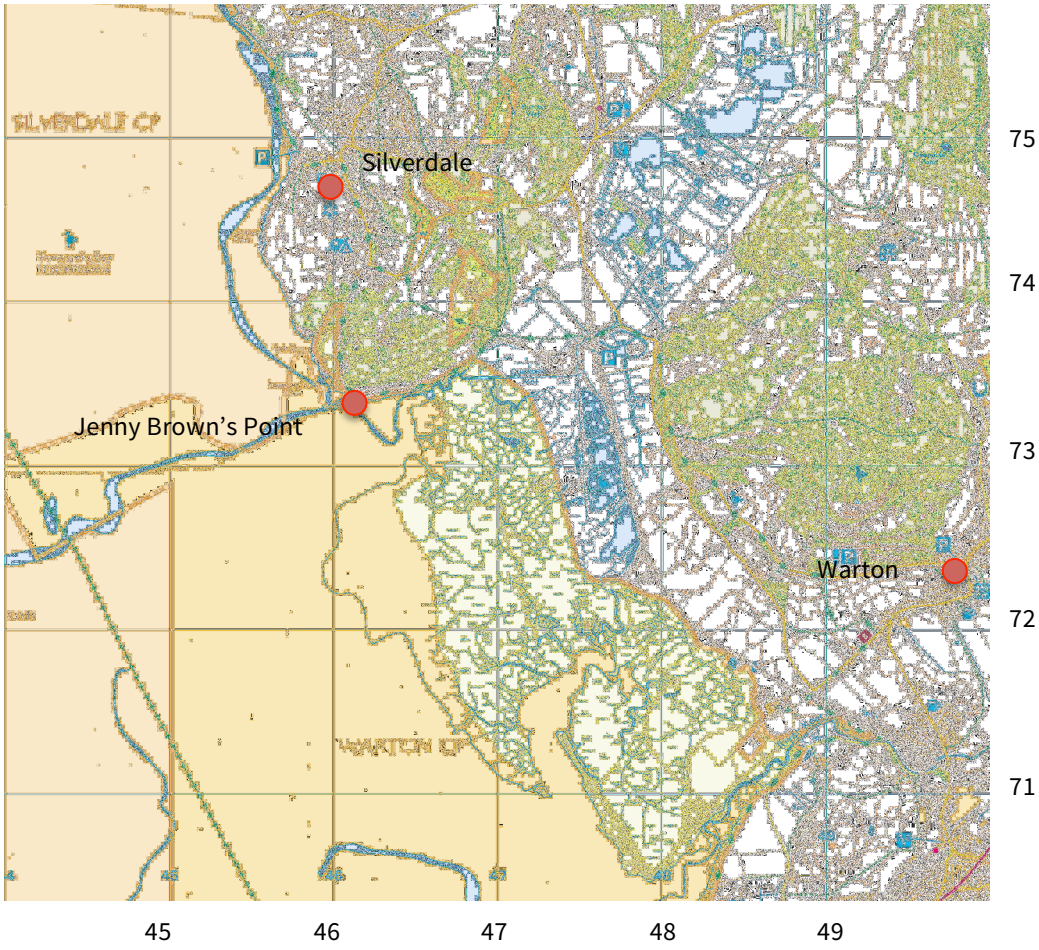

Figure 1. Location of Jenny Brown's Point, Silverdale and its relationship with nearby towns. Ordnance Survey mapping provided by Lancashire County Council under licence no. 100023320

2.2 T
h
e location of the two sites of interest is shown in Figure 2 and consists of two discrete areas:

- Site 1: Located to the south of Jack Scout at 'Jenny Brown's Point' is the remains of stone 'embankment' (Site 1A, Plate 4) associated with a failed late 19th century land reclamation scheme, a substantial stone constructed L-shaped wall (forming a jetty/quay/landing platform; Site 1B, Plates 8 to 10) and concrete/brick/ metal remains that appear to be associated with 20th century military structures (Site 1C, Plate 12).
- Site 2: Situated to the east of Brown's Houses and located on the shore, a circular stone chimney dominates this site and is one of the most iconic and intriguing features in the Bay (Site 2A, Plates 13 and

14). To the east of the chimney, stone building foundations are eroding from the saltmarsh (Site 2B, Plate 17) along with a stone wall (Site 2C, Plate 20). To the south-west of the chimney is a rectangular stone feature (site 2D, Plate 21), which has been interpreted as a jetty. These features may form part of a late 18th century copper-smelting works

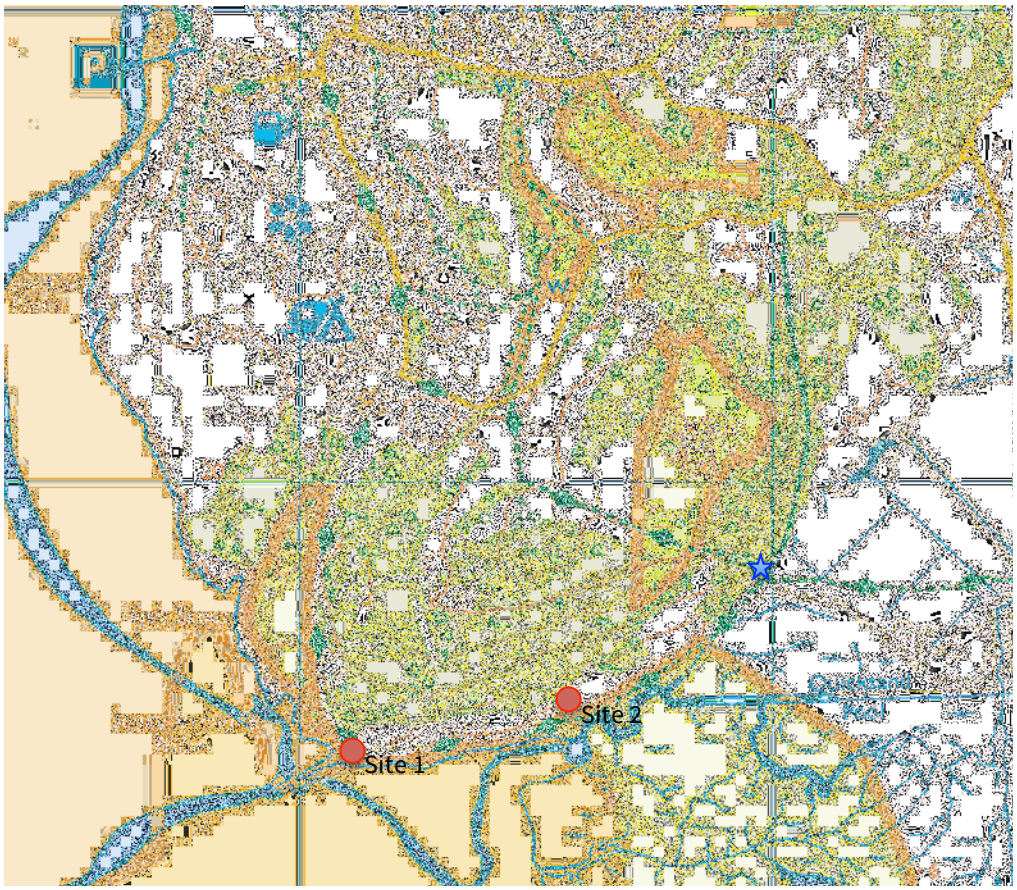

Figure 2. Location of Site 1 and 2, Jenny Brown's Point. Ordnance Survey mapping provided by Lancaster County Council under licence no. 100023320

3 Archaeological and Historic Background

3.1 The two sites at Jenny Brown's Point have been subject to a number of recent studies, as well as being reported in publications over the last century. This section presents a brief overview of the historical and archaeological background of the sites, with a more comprehensive overview outlined in a desk-based assessment covering the area, which is being produced as part of the Headlands to Headspace Landscape Partnership Scheme (Martin et al in prep). Where reference is made to information held by Lancashire County Council Historic Environment Record it is referred to in the text as HER with the Primary Record Number (PRN) quoted. e.g HER PRN 12271. The HER records were obtained in June 2015.

3.2 Prior to outlining the background to the two sites, the intriguing name of 'Jenny Brown's Point' will be examined. Of importance to the researcher is that the area was not always known by this name, with Silverdale Point, Lindeth Point and Brown's Point all being documented in historic maps/records

3.3 The earliest reference found to the place name (to date) is dated to the early 18th century, when the site was known as Silverdale Point. This name was used by Fearon and Eyes in 1737 when they surveyed the seacoast from the Harbour of the Wyre to Black Coombe (Cuthbert Woods 1946, 172). Unfortunately, the section of Fearon and Eyes chart held at the Maritime Museum in Lancaster, which would have shown Silverdale/Arnside, and may have held cartographic information about the area, is missing (Lancaster County Council 2008). This place-name continued into the 19th century and the area is shown as such on Greenwood's 1818 map of the area (Plate 1). The 1812 Warton Enclosure, however, records Brown's Point (S. Williams pers. comm..).

Plate 1. Excerpt from Greenwood's 1818 map of Lancashire showing Silverdale Point

3.4 By Hennet's map of 1829 the same location is now called Lindeth Point (see Plate 2), however, by the following year a 'Plan of Estate in Lindeth' it is

called Jenny' Brown's Point (S. Williams, pers. comm..), a name which continues onto the 6 inch to 1 mile first edition Ordnance Survey map (Plate 3), which was surveyed in 1845,, the name which is retained today. See Table 1 (below) for the chorological nomenclature of the point and Brown's Houses, which was compiled by Simon Williams.

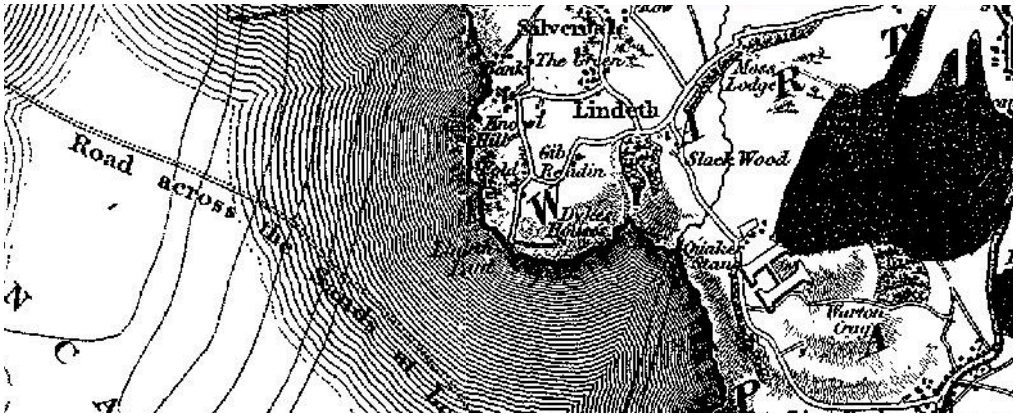

Plate 2. Excerpt from Hennet's 1829 Map of Lancashire showing Lindeth Point

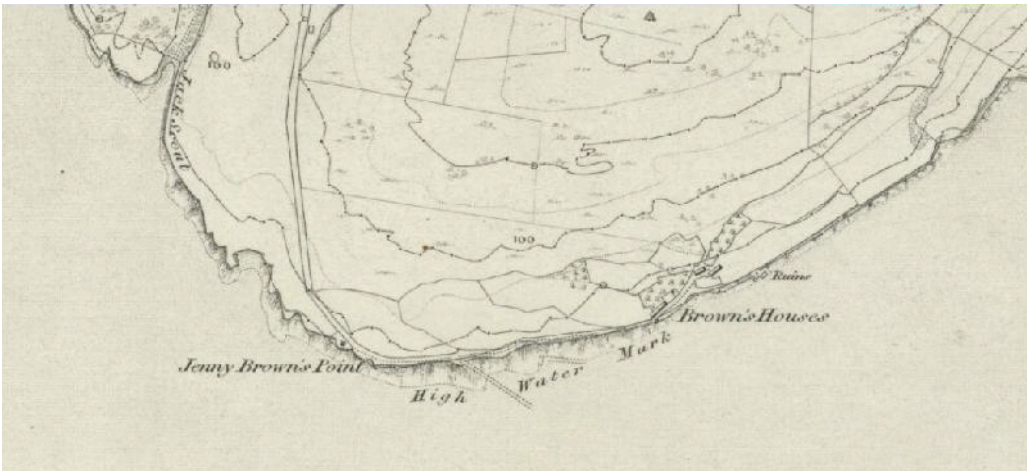

Plate 3. Excerpt of the 1848 6 inch to 1 mile Ordnance Survey map showing Jenny Brown's Point. Lancashire Sheet XVIII. Surveyed 1845.

Date	Source	Nomenclature of the 'Point'	Nomenclature of area now known as 'Brown's Houses'
1812	Warton Inclosure (and newspaper reference dated 8th August 1812)	Brown's Point	
1818	Greenwood's Map	Silverdale Point	No name
1828	Hennet's Map	Lindeth Point	Dykes Houses
1829	Plan of Estate in Lindeth	Jenny Brown Point	No name
1845	Tithe Map	No Name	No name

Date	Source	Nomenclature of the 'Point'	Nomenclature of area now known as 'Brown's Houses'
1848	OS Map	Jenny Brown's Point	Brown's Houses
1851	Census	Jenny Brown's Point	
1891	OS Map	Jenny Brown's Point	Brown's Houses
1913	OS Map	Jenny Brown's Point	Brown's Houses

Table 1. Chronological nomenclature of the point and what is now Brown's Houses, compiled by Simon William's

3.5 The origin of the name 'Jenny Brown's Point' has been debated over the years and reasons presented for the name include:

Cuthbert Woods (1946, 172):

- The name given to an old steam engine or crane, which used to work (or not a the case may be) in the adjacent quarry, when the scheme for reclaiming the foreshore at this location point was in progress

Riley 1958 (see Williams 2017, 15)

- A young woman looking out to see from the shore, hoping for the safe return of her lover. He was never seen again, and nor was she; the fate is unknown

Bolton and Fogg (1978, 5)

- A old lady who kept pigs
- A young lady who entertained casual visitors
- A 'jenny or ginny' engine used in the crushing of copper ore

Walling (1985, 8)

- A steam engine which was used as part of the alleged copper smelting works
- A lodging house keeper who looked after Irish miners employed in copper mining and smelting
- Jennye Brown daughter of John Walling who resided at Dikhouse' in Lindeth in the late 17th century (the building still survives and is know as Dyke House)

3.6 A more detailed appraisal of the evidence was compiled in 1984 by M.R Walling 1984 and local historian Simon Williams has revisited and reported on this topic in recent years (Williams 2017, 12-15). Through his research William's established that Jennet (Jenny) Wawen (Walling) was born at

Dykehouse farm (i.e. at the farm at Jenny Brown's Point) in 1628; she married a neighbour Robert Browne – so became Jenny Browne. Their second of four daughters was baptised in 1665 as Jennet Browne. So in the 17th century two Jenny Brown's lived near the point, however, why it was named after one of these women still remains a mystery (Williams 2017, 15). Interestingly, one of the H2H volunteer researchers found a newspaper article from the Lancaster Gazette dated Saturday 9th May 1874 which stated that 'A man named Hall had a boat at Jenny Humphrey's, Brown's Point, but it was kept in the channel because there was no water near his Cottage. Could this also be part of the story of the name of Jenny Brown's Point?

3.7 An overview of the historical background of the two sites is presented below. Site 1 includes the embankment at Jenny Brown's Point and Site 2 covers the chimney site and associated features to the east of Brown's Houses (Figure 2).

Site 1

The 'embankment' (Site 1A)

3.8 The linear limestone rubble 'embankment', which extends southwest from the tip of Jenny Brown's Point, is the most dominating historical feature in this area and one which is currently clearly visible extending out into Morecambe Bay at low tide. Coastal processes, however, shift the sands in this area and the embankment is known to have disappeared beneath the sands, often causing surprise when it reappears (see 3.18).

3.9 In recent years, this feature has received significant research, in particular by Mourholme Local History Society current chair, Simon Williams, who has encapsulated the social history/story of the site in a number of publications-Williams, 2014 and 2015.

3.10 The remains of the embankment, which survive for a distance of *c.*1.66km into the Bay, were part of an ambitious land reclamation scheme-the vision of Herbert Walduck, a Manchester Metal Broker (Eadie 2012, 158 and Williams 2014, 17). The schemes laudable aim was to reclaim thousands of acres of land by building walls and embankments into Morecambe Bay, with the reclaimed land being used for agricultural purposes as well as constructing villa homes along the new shoreline and providing quicker railway access to the Furness Peninsula and coastal towns of Westmorland and Cumberland (Williams 2014, 16-17).

Plate 4. The remains of the embankment in 2015 formed of stone cobbles extending out into Morecambe Bay from Jenny Brown's Point, looking south-west

3.11 The original scheme was put to parliament as a Bill in 1874 by 'The Warton Land Company', which proposed enclosing an area from Arnside Park Point to a point just north of Hest Bank, enclosing 6,300 acres (ibid, 20 and 21, see Plate 5).

3.12 The initial scheme was met with objections in particular concerning the loss of grazing rights and to fish the foreshore of Silverdale (e.g. Lancaster Gazette, Saturday 9th May 1874, 3 and Bolton 1995).

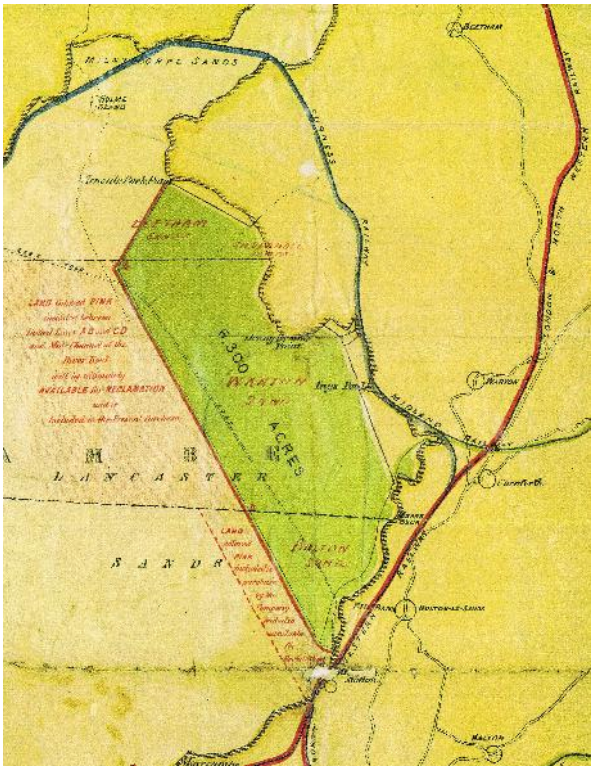

Plate 5. Plan showing the original proposed land reclamation scheme from Arnside Park Point to Hest Bank. Submitted by Simon Williams

3.13 Whilst the Bill was granted Royal Assent in July 1874, it only permitted building from to Jenny Brown's Point to Hest Bank, as the rights given to the Silverdale inhabitants to graze and fish the foreshore in the 1811 enclosure

did not apply to those of Lindeth (S. Williams, pers. comm..). There was a subsequent resubmission of the original Bill to Parliament in 1876, and permission was granted from Jenny Brown's Point (Williams 2014, 22-23).

3.14 Building finally commenced in February 1877 (Williams, 2015, 2) and a considerable workforce for the scheme was required with labour being brought in to work on the construction. Many of the workers may have resided at a lodging house at Brown's Houses just to the east of the site, which contained 40 furnished rooms (Williams 2014. 1). These lodgings are reported to have been named 'PaddyCan' (Bolton and Fogg, 1978, 5 and Williams 2014, 2) with 'Paddy' reflecting the Irish workforce who resided at the property and provided labour for the scheme and 'can' or 'ken' reported to be an Elizabethan word for a low hostelry or lodging (Bolton and Fogg, 1978, 5). No 1 and 2 Brown's House are Grade II listed buildings (No. 1362447).

3.15 The 'embankment' was constructed of limestone quarried from a large sub-rectangular quarry to the north of Lindeth Road (Lancashire HER PRN 12271), the extent of which is shown on historic mapping and can still be seen today (see Figure 2 and Plate 6).

Plate 6. Excerpt of the 1891 25inch to 1 mile Ordnance Survey map of Jenny Brown's Point showing the embankment and the l-shaped area of the quay. Sheet XVIII.14. Surveyed 1889

3.16 The stone for the embankment was transported by rail (trucks pulled by horse) through a (now in filled) tunnel, under Lindeth Road and out to the embankment (Williams 2015, 2). Construction on the embankment was slow, hampered by the tides and ever shifting sands. By 1879 a steam locomotive (named Jenny Brown) was bought to assist with construction and the haulage of the quarried limestone, in an attempt to speed up construction, however, financial problems stopped construction towards the end of 1879 (Williams 2015, 3-5).

3.17 Despite an extension to the Bill beyond the initial ten years granted, construction was never to restart on the scheme (Williams 2015-6-7) and by 1885 the work programme has been abandoned due to lack of funds (Eadie 2012, 158). The shifting sands of the Bay covered the progress made on the scheme soon after construction had ceased, leaving just a 'banking pole' (see below) marking the end of the embankment.

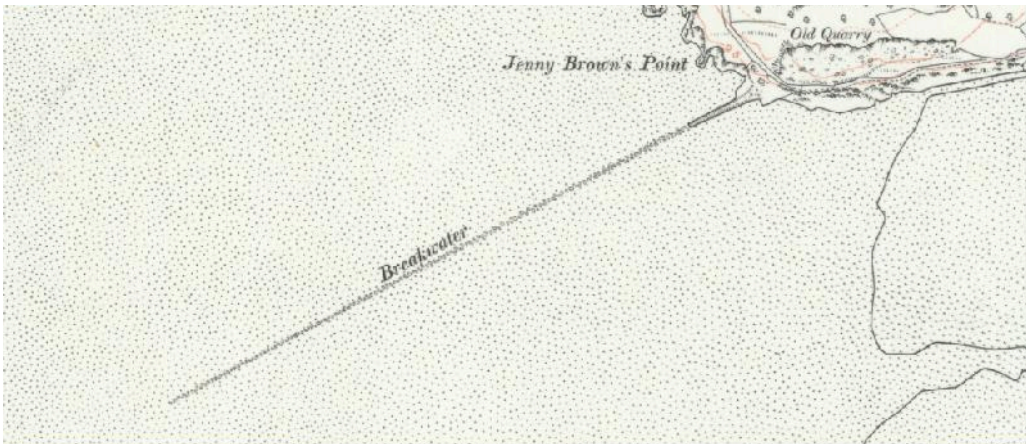

Plate 7. Excerpt of the 1919 6 inch to 1 mile Ordnance Survey map of Jenny Brown's Point showing the embankment and the l-shaped area of the quay. Sheet XVIII.SW. Revised 1910 to 11

3.18 The embankment was uncovered in 1894 and again in 1975, when the Lancaster Guardian reported examination of the finding by the fisheries department and removal of rails (some twisted into the air) as they were a danger to boats. The reporting of this discovery included the 'banking pole'- a long pole supported by iron cables guys with a basket at the top, which was destroyed by storms in the 1930s (Williams 2015, 9).

3.19 The scheme has been described as Williams as the 'most risky and ambitious infrastructure project ever attempted on the Bay' (2014, 16).

3.20 The remains of the embankment scheme are recorded in the Lancashire Historic Environment Record (HER) under PRN 11302. It was only partially exposed in June 2011 when the Phase 2 North West Rapid Coastal Zone Assessment (NWRCZA) survey was undertaken, therefore detailed recording was not feasible at this time as no safe access was available to the remains (Eadie 2012, 159). The site, therefore, has never been surveyed/recorded in detail.

The quay/jetty (Site 1B)

3.21 Little is known about the substantial L-shaped quay, which survives (now partially collapsed especially in the centre) at the north-eastern tip of the embankment (see Plates 8-11). Whilst the relationship with the embankment (Site 1A) is unclear on the ground/in plan, it is recorded in the HER (PRN 11302) as being directly associated with the embankment. Perhaps this quay was used to bring in equipment/materials for the embankment construction works?

Plate 8. Site 1B (front left) with the embankment (Site 1A) in the background (August 2014)

Plate 9. The north-eastern extent of the remains of Site 1B showing the collapsed central section (August 2014)

3.22 The quay identified at Site 1B has been included as part of an online blog (Beating the Bounds 2012), where it has been (wrongly?) associated with the chimney site rather than the embankment. Further research is required to

examine this date and use, along with its relationship with the embankment.

Plate 10. The south-western limits of the stone quay/jetty with the embankment (Site 1A) in the background (August 2014)

Plate 11. Volunteer Simon Williams inspecting the north east-south west wall forming the southern side of the quay. The rubble of the embankment is in front. (August 2014)

Possible military remains (Site 1C)

3.23 A number of brick/concrete foundations are visible on the north-eastern tip of the embankment (Site 1A). These appear to post-date the embankment, however, what survives is fragmentary and collapsed. It is possible that these features are associated with the military use of the area in the Second World War, although no sites are listed in this area in the Defence of Britain database (.http://archaeologydataservice.ac.uk/archives/view/dob/). Bombing targets and associated military buildings were mapped through aerial photographs and are recorded on Lancashire HER as PRN 33125. Upright posts that still can be seen in the distance to the south-west of Site 1C. These apparently supported a large canvas sheet with a target, which was used for bombing practice. The staff who controlled the bombing range were billeted at Brown's Houses. The remains at Site 1C require further investigation to determine if they formed part of this bombing practice range.

Plate 12. Brick and concrete remains, forming part of a structure constructed above the embankment (Site 1A). Note, the collapsed rubble/remains of the quay/jetty in the background (Site 1B).

Site 2

3.24 Site 2 comprises a number of distinct features, including a cylindrical chimney (Site 2A), wall foundations (Sites 2B and C) and a stone jetty (Site 2D). One of the aims of the on going research is to determine, if possible, the relationship between these features, their date and function.

The chimney (Site 2A)

3.25 The chimney (Plates 12-13), which stands *c*.12m in height, forms one of the most iconic sites on the coastline of Morecambe Bay. It is located to the east of the headland at Jenny Brown's Point, and to the east of Brown's House, north of Quicksand Pool, a steam which flows into Morecambe Bay from Leighton Moss and skirts the southern edge of site (Figure 2).

Plate 13. The chimney at Jenny Brown's Point (Site 2A), looking east (March 2015)

3.26 The function of the chimney has received much debate and conjecture over the years with a variety of uses proposed. The various possibilities are

summarised in Cuthbert Woods 1946 article on the 'Lights of Lancashire and Cheshire' where he records the chimney as:

> *'The Tower, which is built in local limestone, is about 35 feet high, circular in section with a circumference at the base of about 20 feet, tapering to about 3 feet, hollow like a chimney and open at the top. There is an opening on ground level about 2 ½ feet by 2 feet on the landward site, and a similar opening on the opposite side has been built up. No one seems to know definitely what it was built for, but there are several theories. It is said to be the ventilation shaft of a mine, but there is no excavation under it, and no signs of any mine near it. I have seen it stated that it was the chimney of a lime kiln, but old lime kilns did not have chimneys. Another suggestion was it was the chimney of a copper smelting furnace, but if so where is the slag which is always to be found in the vicinity? Whatever its use, it is very free from discolouration inside and in fact shows no sign of being used for any of these purposes' (173).*

Plate 14. The chimney site (Site 2A) to the left with the remains of the revetment/quay (Site 2C) to the right, looking north-east *(August 2014)*

3.27 The majority of the published texts (e.g. Bolton and Fogg 1978; Johnson 2009, 141, Eadie 2012, 155- No. 22A, Greenlane Archaeology Ltd 2013, 41) and the HER (PRN 4821) maintain that the chimney is part of a late 18th century copper smelter.

3.28 The Carboniferous Limestone geology of the local area contains a variety of mineral deposits primarily iron and copper (Ashmead and David 1983, 5;

Moseley 2010, 11-28) and mining is known to have taken place in the local area at least since the 18th century. Moseley (2010, 30) has suggested that local place-name evidence, which includes the word 'red' (Red Hills at Arnside and Red Rake at Silverdale), suggests early mining of iron ore, possibly during or before the Monastic period.

3.29 Documentary evidence survives for small-scale commercial mining for haematite and exploitative explorations for copper ores being undertaken in Arnside and Silverdale in the 18th century (ibid). Crag Foot, near Warton Crag (*c*. 1.7km to the east of Jenny Brown's Point; Figure 1) saw significant mining activity during the 19th century, where ores of copper, 'red haematite' and possibly other ferrous oxide ores were mined, an industry which continued until 1894 when the last mine went into liquidation (Moseley 2010, 31). Mining to the immediate north of Site 2, on Heald Brow and at Lindeth (near Greystones) is known to have been undertaken in the 1880s, which were managed by Steve Bisbrowne, with the foreman being Charles Richmond (Moseley 2010, 72). These mines were probably worked for ochre and iron ore by the Warton Mining and Colour Co. Peters (1984, 8), states that copper was mined at Heald Brow but interesting states that Heald Brow became known as Charlie's Ground after the foreman (Peters 1984, 8), a name also referred to by Moseley (2018, 72) suggesting that this was the same operation.

3.30 The success of Warton Copper Mine is recorded in the Kendal Mercury dated 19th August 1837 which states:

> *'Considerable quantities of the most valuable copper ore continue to be obtained at this mine, which is situated on the N.W, side of Warton Crag……..Several cottage are in the course of erection near the works for the use of men employed; a circumstance to convince the most incredulous, that great hopes are entertained that the mine will bring in a considerable revenue to the proprietors. An excellent red paint is also obtained……Some Cornish and Welsh miners are at present busily engaged.."*

3.31 Whilst the mines at Warton Crag are some distance from Site 2, the rights to mine and take minerals from this land are an important element to consider in unravelling the history and story of the chimney.

3.32 The Warton Crag mines were part of the Manor of Yealand Conyers, one of three manors (including Yealand Redmayne and Yealand Storrs), which had been sold to Charles Gibson in 1713 (Farrer and Brownbill 1914b, 177-180). As Lord of the Manor the Gibson family had rights to mine minerals within their estate and Moseley records a number of agreements made in 1714, 1719 and 1757 between various members of the Gibson family to 'work all mines of lead, copper, iron and tin in all lands and commons in the Manor of Yealand'. The latter lease was granted to Anthony Tissington and also included the rights to 'erect buildings and other necessary works' (Moseley 2010, 39). Tissington is known to have opened pits near Crag Foot, however, whilst the

ore mined was good quality, the quantity recovered did not make the mines financially viable and the venture was closed in 1759 (Moseley 2010, 39-40). Ashmead and Peter (1983, 7) suggest that the copper extracted from the Lower Mine and Higher Mine on Warton Crag was smelted at the works at Jenny Brown's Point and the copper was used to produce bronze to manufacture cannons for use in the Napoleonic Wars. Whilst an interesting interpretation, the source of this information is currently unclear. It should also be noted that there is some 40 years between Tissington's ventures and the Napoleonic Wars (1805-1815).

3.33 At the time of Inclosure Act in 1777 Sarah Gibson was lady of the Manor of Yealand, which included the wastes and commons on Warton. Following inclosure, Lady Gibson would loose rights and interest in the commons and waste grounds. To compensate her for this loss of rights she had twenty acres of land allotted to her, including land around Leighton Furnace (Farrer and Brownbill 1914, 177-180 and Moseley 2010, 41). The mineral rights to the commons and wastes, however, were excluded from this allotment, a loss which has been postulated by Moseley as an oversight, possibly excluded as the mines had been inactive since Tissington abandoned them in 1759 (2010, 41).

3.34 Following Sarah Gibson's death 1778 her estate pasted to Robert Gibson who sometime between 1778 and 1782 began trials for ore at Crag Foot. One problem with this venture was that it was on the former commons and wastes around Crag Foot, which had been allotted to Townley (Neville and Manning, 1834). Robert Gibson obviously believed that as Lord of the Manor of Yealand his rights to prospect for minerals and erected buildings had been maintained, even following allotment of these commons and wastes to Townley. It has been suggested by Max Moseley that a small copper smelter and a quay was built at Jenny Brown's Point sometime between 1782 and 1788 possibly by Gibson to smelt the illegally-extracted copper ore from Townley's land (2010, 43 and S. Williams, pers. comm..).

3.35 The resulting legal case that pursued between Townley and Gibson was complex, acrimonious and long-standing. Paperwork relating to the case is held in the Towneley of Towneley family archive held at Lancashire Archives Preston (Ref. No. DDTO/L/13/10-70) and a summary of the case ruling is presented in Neville and Manning (1834, 426-7). The outcome from the Court of the King's Bench came in 1788 where it was determined the rights to the commons was Towneley's. Mining ceased following Gibson's loss and the Gibson family sold the Yealand estate in 1791 (Moseley 2010, 41-44).

3.36 It is suggested that the copper smelter at Jenny Brown's Point was demolished in 1802 (Mourholme Local History Society 2005, 81), however, where this date has been derived from is unclear.

3.37 A direct link between Gibson's ventures at Warton and the possible copper smelter at Jenny Brown's Point has not been firmly established. Some questions remain, which require further investigation and research. In

particular why construct a smelter at this point, some distance away from Gibson's mining ventures at Warton Crag. Additionally, who owned the land where the chimney was built? The Warton-with-Lindeth Tithe map of 1846 (Plate 14) indicates that the site of the chimney is contained within wastes, commons and roads (see 3.39 and Appendix 2).

Plate 15. Excerpt from the 1846 Warton-with-Lindeth Tithe Map showing the area around Jenny Brown's Point (No. 795) and the chimney site labelled 'mining shaft'.

3.38 The minor manor of Warton-in-Lindeth was held in the 18th century by the Brockholes of Claughton (Farrer and Brownbill 1914a), and their rights presumably included commons and wastes. Did these rights include the area containing the chimney and what association was there between Brockholes and Gibson?

3.39 Of importance is that some of the published dates for construction of the copper smelter (e.g. 1792 published in Warton in Lindeth by the Mourholme Local History Group 2005, 81) are after the loss of the Townley/Gibson legal case, the cease of prospection for minerals and the sale of the estate by the Gibson family.

3.40 Interestingly, Robert Gibson's copper enterprise is mentioned in a letter wrote by William Hutchinson, a solicitor living in Barnard Castle, County Durham and a Fellow of the Society of Antiquaries, which details his visit to Warton Crag. The letter was written in 1788 but refers to 1785 and was published in an "Account of Antiquities in Lancashire". The second paragraph reads '*In the beginning of July 1785, being upon an excursion into Lancashire, I was led to view the British remains in the parish of Warton, about eight miles from Lancaster; my curiosity being greatly excited by the accounts given thereof in conversation with Robert Gibson, Esq. who for some months in the summer makes Yelling the place of his residence, on account of the copper-*

works he is projecting there' (Hutchinson 1789*).*

3.41 So whilst there is tentative evidence to link the chimney site with Gibson's copper exploration enterprise, verification has yet to be found that he was responsible for its construction. So if Gibson was not responsible for the construction of the copper smelter who was and what evidence survives to support other options?

3.42 Documentary research undertaken as part of the desk-based assessment located a Crown Lease for Warton dated 1784. This document has been transcribed by Kevin Grice (see Appendix 3) and details a lease granted to John Parkinson of Burton in Kendal-Surgeon, John Jenkinson of Yealand-School Master and Anthony Atkinson Lancaster-Gentleman for:

> ***ALL*** *and all manner of Mines of Copper, Lead, Tin, Iron, Coal and other Mines and Minerals whatsoever found, gained, dug or opened or hereafter to be found, gained, dug or opened within, upon or under the Commons or Waste Grounds or other Lands belonging to the Crown within the Manor of Warton otherwise Warton with Lindeth or within the Township of Warton with Lindeth in the said County of Lancaster with full Power, Liberty and Authority to dig and open the Ground and Soil and to try and search for, get and take the said Mines and Minerals and to melt, smelt, convert, carry away, sell and dispose of and to erect such Mills, Warehouses, Smelting Houses and other Works and Buildings and to sink and make such Hydraughts and Watercourses in, through and over the said Lands or any part thereof as shall be found necessary, useful or expedient for the draining,, working, winning, managing and maintaining the said Mines or any of them*
>
> *EXCEPTING nevertheless and always Reserving all Royal Mines of Gold and Silver*
>
> *AND ALSO EXCEPTING all such Mines as have been demised or granted by his Majesty or any of his Royal Predecessors for Terms of Years or other Estates as yet unexpired and not forfeited or surrendered if any such there be at this Annum*
>
> *Examined by me G Augustus Selwyn Surveyor General Dec. 17, 1784"*

3.43 Given that the Tithe appointment records the area containing the chimney site as '765-roads, rivers or waste, it is possible that this site formed part of the wastes leased to Messrs Jenkinson, Parkinson and Atkinson. The date of the lease corresponds to the late 18th century date published for the chimney site (e.g. Bolton and Fogg 1978, Moseley 2010 and Mourholme Local History Society 2005, 81) and gives rights to search for and get minerals, and to melt smelt and erect mills smelting houses and other works. Could the chimney and associated buildings at Jenny Brown's Point have been erected under this lease? Further archive searches into the interests of Messrs

Jenkinson, Parkinson and Atkinson may be of value in establishing if they had any connections with the site.

3.44 Whilst who constructed the chimney is still to be determined, family memories recorded by local historian the late Tom Bolton, provides a fascinating insight into the possible construction of the site. The Boltons have been connected with Silverdale since the 16th century and were a family of masons and builders. The memories recorded by Tom Bolton are very detailed and record that the works and the chimney were built by Welsh craftsmen (Moseley 2010, 52 referring to Tom Bolton's memories) with the boiler and blowing machinery for the smelter being brought to Jenny Brown's Point by ship and assembled on the shore. On completion of the building 'Off She Goes' was played on an Irish reel and the steam engine to crush the ore was started (Bolton and Fogg, 1978, 5 and 42). Bolton and Fogg also record that the ore came to the site from Crag Foot after mining near Jenny Brown's Point was unsuccessful (1978, 5 and 42). Copper ores of malachite, azurite and cuprite were mined in small quantities in mines on Warton Crag and Grizedale Wood and are recorded In Warton 1800-1850 as being smelted at Jenny Brown's Point (Mourholme Local History Group 2005, 81). This publication also states that the venture at Jenny Brown's Point only lasted for ten years, closing in 1802 when the buildings other than the chimney where demolished (ibid). The machinery, which once was used at the site, is recorded as being removed by ship (Bolton and Fogg 1978, 5 and 42) and Moseley states that the adjacent engine shed and furnace shed had mostly been demolished by 1900, with the remaining ruins destroyed in the 1930s to build a bridge across the stream to assist with turf cutting (Moseley 2010, 52 referring to Tom Bolton's memories).

3.45 Two Lancaster Guardian newspaper articles referred to by Mosley (16th March 1805 and 2nd March 1811; ibid) have been examined but no information regarding the chimney site, the Bolton family or Robert Gibson could be found.

> *The majority of the evidence presented within the written texts (summarised above) indicates that the chimney was part of a copper smelter, however, the lack of conclusive evidence has given rise to debate over its function. Cuthbert Woods (confer 3.26) presented a number of further possibilities of its use, including a beacon. This interpretation is based on Father West's 1796 guide to the Lakes which shows a tower with flames and smoke 'issuing from the top' with the caption 'beacon' beneath the illustration. This illustration is reproduced by Cuthbert Woods (1946, 173) and he states that it may have been used to guide ships bring ore into Leighton Beck or as a guide for persons crossing the sands from Hest Bank to Silverdale (ibid, 174). This theory is reviewed by John Bolton in his article on the chimney published in Keer to Kent in 1983 where he states:*

'Until more evidence is available to support the copper smelter theory, it would seem that preference should be given to its use as a beacon for coastal shipping. In this case the date of construction would probably be early 18th century, corresponding with the building of Leighton Beck Furnace' (Bolton 1993, 49).

3.46 In a later publication of Keer to Kent, however, this theory was dismissed stating alternatively that it is '*around the corner of Jenny Brown's Point and in an unsuitable position*'. (Bolton 1995 from HER PRN 4821)

3.47 It would seem that Cuthbert Wood and possibly Bolton were examining the site as comprising just the chimney, without taking into context the associated building to the east, illustrated on both the Tithe and first edition Ordnance Survey maps (Plate 16). The difference in orientation of the rectilinear building, on a north to south alignments on the Tithe map and on a north-west to south-east alignment, on the 1848 Ordnance Survey map (Plate 15) should be noted.

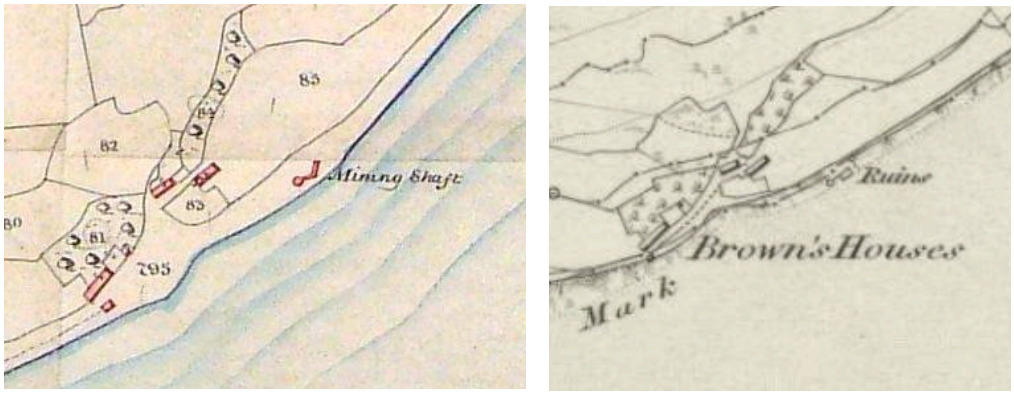

Plate 16. Close up of the 1846 Warton Tithe map (left) and the 1848 6 inch to 1 mile Ordnance Survey maps (right) showing the area containing Site 2

3.48 These maps together with historic photographs (Plates 18 and 19) and the exposure of previously concealed foundations (Plate 17) revealed as the salt marsh around the area erodes indicate that the chimney was associated a rectilinear structure located to the east of the chimney forming a much larger complex of buildings .

3.49 Another potential function proposed by Cuthbert Woods (see 3.26) was a ventilation shaft of a mine but he ruled out this interpretation on the basis of there being 'no excavation under it and no signs of any mine near it'. The limestone in the area is also highly fissured and it has been proposed that it would be highly unsuitable geology to bear a mineshaft that goes below the sea level (S. Williams, pers. comm..). It is, however, of interest that the 1846 Tithe map (Plate 15 and 16) shows a circular feature (the chimney?) with a rectangular feature leading to the east into a larger north to south aligned building. This area is labelled 'mining shaft' and presents some credence to the theory it may have a mining function. Recent discussions as part of this project have proposed that rather than a ventilation shaft could the site be a pumping house used to pump water from a mine? This interpretation has

been ruled out by the majority of volunteers involved in the project, given the proximity of the site to the coast and the likelihood that it would have flooded.

3.50 As part of the NWRCZA the site was subject to a rapid walkover survey in 2008 and 2011 (Johnson 2009, 216 and Eadie 2012, 155) where it is described as the standing remains of a short chimney stack, constructed of well-coursed limestone masonry which stands to *c.*10-15m in height above a base plinth. The opening of the chimney in the south-east face is mentioned as well as its well-maintained condition (Edie 2012, 155-6).

3.51 The chimney is described in the Historic England 2015 listing (No. 1317165) as:

> *'Tower on Shore at Jenny Brown's Point, 120 meters east-north-east of Brown's Houses. Chimney c. 1800. Squared coursed limestone. Of hollow round section, about 10 metres high and tapering, with rectangular opening into flue on east side, near ground level. Said to be the remains of a copper smelting works active c.1780-1820. Bolton, T.E. and Fogg, I.J, 'Silverdale', N.D.'*

3.52 This summary of the chimneys background demonstrates the need for further research and investigation focused on the many questions that remain unanswered, in particular how it relates to the other archaeological remains contained in the vicinity (Sites 2B-D).

Building Foundations (Site 2B)

3.53 To the east of the chimney site, the limestone remains of building foundations are clear (Plate 16), eroding from the small section of salt marsh which remains in this area. This area of saltmarsh can be seen as occupying the surface of an artificial platform extending out from the natural shoreline and retained on its south side by revetment wall 2C (see below), with the built features exposed by tidal erosion either along the south edge, or within a more limited erosion scar on the surface of the platform (which lies just below current maximum high-tide level).

Plate 17. Site 2B: Wall foundations located to the east of the chimney, eroding from the saltmarsh, looking south-west (August 2014)

3.54 Communication recorded in the HER (PRN 4821) indicates that in 2008 erosion relating to high tides began to reveal possible flooring, sandstone flags and large dressed limestone blocks. These foundations were mentioned in the Phase 1 NWRCZA (Johnsons 2009, 216) and recorded rapidly during Phase 2 of this project (Feature 158, Eadie 2012, 155-6), where they are described as consisting of:

> *'regular linear alignments of limestone that have the appearance of being man-made. They cover an eroded area of c.73m2. The foundations are difficult to understand in their current state and may be the remains of one building or several'. Ordnance Survey mapping does not show the form of any buildings at the site' (Eadie 2012, 156).*

3.55 They were also recorded by Greenlane Archaeology Ltd in 2013 as '*the remains of walling perhaps only one two courses high, constructed from roughly dressed limestone blocks with a 1.3m long section orientated north-west/south-east coming to a corner where there is an iron bolt set into the stone. The return then disappears beneath the turf. The north-eastern section has a slight return before forming one side of a channel'.*

3.56 Mid-19th century historic mapping identified during the course of this recent project, mid-18th century historic mapping (Plates 3, 15 and 16) shows a rectilinear structure, connected at its south-western end by a narrower linear structure which leads to a circular structure (the chimney?). It's likely that the foundations currently being exposed, on the top of the platform at Site 2B relate to this rectilinear structure. It should be noted that the features

shown on the 1846 Tithe map and 1848 Ordnance Survey map are on different orientations (see Plate 16).

3.57 Historic images/postcards (Plates 18 and 19) collected through research clearly show a partially demolished/collapsed structure in this vicinity. Together these images provide some insight into the scale and construction of this structure and its relation to the chimney.

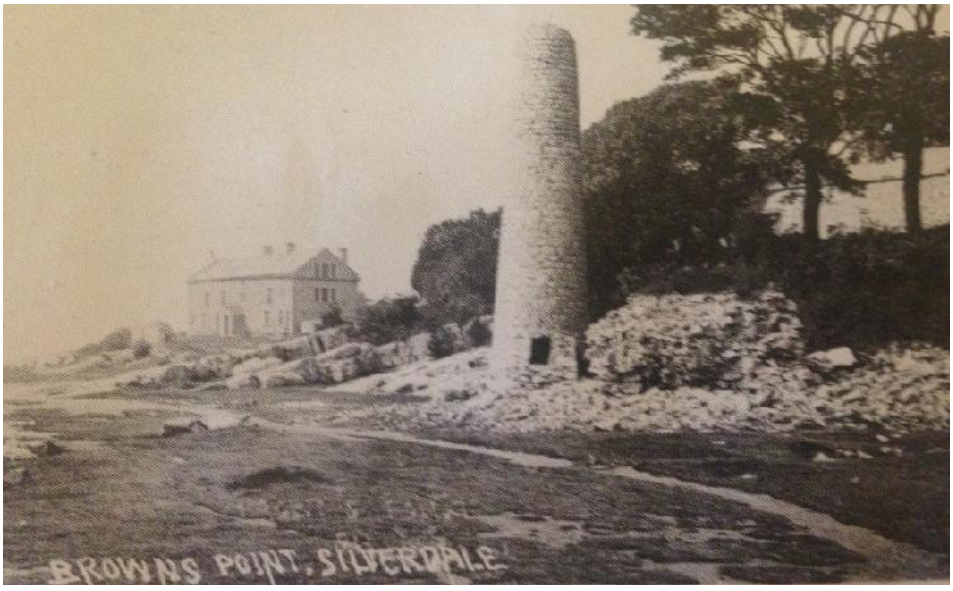

Plate 18. Postcard of Brown's Point, Silverdale showing the chimney site and the remains of a building and wall extending from the entrance of the chimney opening. Barry Ayres archive (currently held at Arnside Archives)

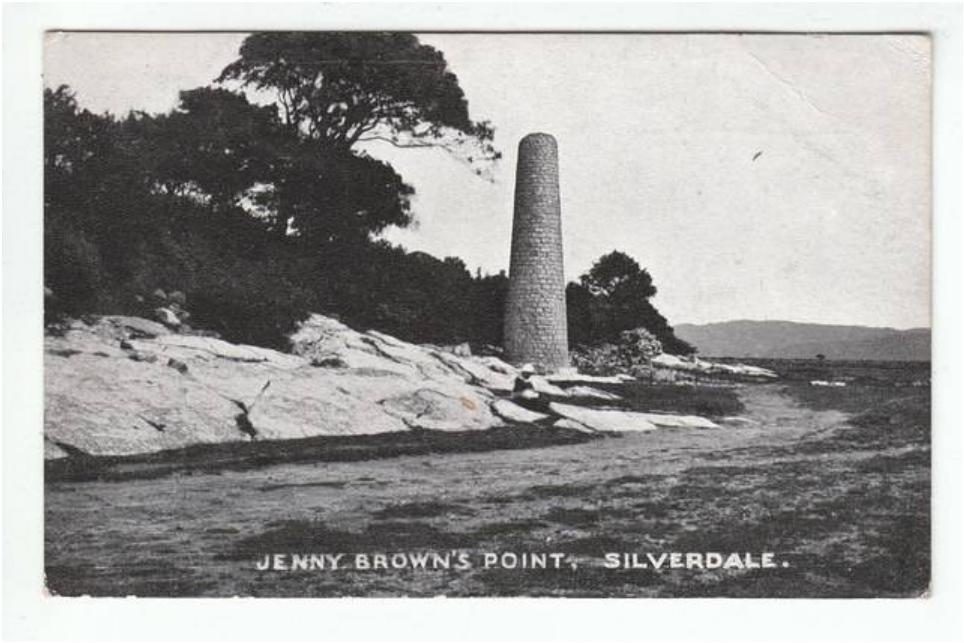

Plate 19. Early 20th century postcard of Jenny Brown's Point showing the chimney and the ruins of a building to the immediate right.

3.58 These foundations were recorded during July-October 2015 and the results are presented in Section 6.

Revetment Wall/Jetty (Site 2C)

3.59 To the south-east of the chimney (Site 2A) and the south of the building foundations (Site 2B) large, roughly square cut limestone boulders form an arc around the southern extent of the site (Plate 20).

Plate 20. Site 2C: The stone wall (in the foreground) forming a possible revetment, looking north-west

3.60 This feature was interpreted as a jetty in the NWRCZA and given its proximity to the chimney stack (Site 2A) a functional relationship was suggested for the two features (Eadie 2012, 156). During the 2012 survey the 'jetty' was recorded to be *c.*17.5m in length and stand to a maximum height of *c.*1.2m (ibid). As noted above, it is now seen as the revetment or wharf wall of the site to its north.

Stone Jetty (Site 2D)

3.61 Located *c.*64m to the south-west of the chimney (Site 2A) a sub-rectangular stone-constructed feature with a recent concrete cap remains extant (Plate 21). This structure has been interpreted as a quay/jetty which was only recently (re)exposed through erosion and the changes in the course of the Quicksand Pool- the stream located to the south of the site (P. Iles, pers. comm; HER PRN 4821).

Plate 21. The sub-rectangular stone structure located to the south-west of the chimney, interpreted as a jetty/quay, looking north-west

3.62 It was exposed during the erosion of the salt marsh during the 1990s with the HER record indicating that it appeared in the spring of 1995 (P. Iles pers. comm.. from HER PRN 4821). A photograph captured by Barry Ayres around this time shows the feature in the process of being exposed with at least seven courses visible at the southern (seaward) end of the structure (Plate 22). The feature was rapidly recorded by Peter Iles during a site visit in July 1995 as follows:

> *'The Jetty is of squared and roughly coursed limestone, and is c.2.5m wide. Circa 4m of its length protrudes from the salt marsh and c.2.5m of its height; it is not known how much of this structure is still buried. It appears unmortared, but the core of rough rubble appears to be consolidated in some way. There is no flagging or other surfacing where the top is exposed by erosion of the turf but this may have been scavenged. The feature is narrow for a quay or jetty, but given the shallow waters here would only ever have served small craft and thus would have been adequate for such a purpose. It is possible, though unlikely, that the feature is a pier for a bridge over Quicksand Pool, the precursor to the present concrete and steel farmers bridge. Yates's map of 1786 show a route along the foreshore and saltmarsh here but suggests that the Pool was more central between Jenny Brown's Point and Crag Foot. This suggests that the structure is more likely to be a jetty……(P. Iles 1994 Pers. Com. from HER PRN 4821).*

Plate 22. The southern end of Site 2D being eroded from the saltmarsh. Photo by Barry Ayres dated c.1995. Note at least seven courses exposed in this image.

3.63 A subsequent visit to the site by Peter Iles in November 1997 recorded continuing erosion, with c. 5m (in length) of the jetty exposed from the seaward end. It was recorded as:

> *'constructed of large limestone blocks, laid flat, with a rubble core. A large baulk of timber can be seen within the core at the seaward end, by erosion of the fill. Any flagging or other surface has disappeared without trace. A few stones from the top course at the seaward end appear to be dislodged, and some small amount of the core washed away exposing the timber mentioned above, but otherwise the jetty appears in a similar condition to the earlier visit. Erosion of the salt marsh hereabouts appears to be accelerating, and Quicksand Pool is moving closer to the shore. The farmer's access bridge has been undermined and collapsed into the Pool…(P. Iles 1997, Pers. Com. From HER 4821).*

3.64 By 2011 and the survey visit undertaken as part of the Phase 2 NWRCZA the salt marsh had continued to erode, to such an extent that the structure was revealed in its entirety. It was rapidly recorded as feature 24, measuring c.24m in length by c.1.5m in height. A concrete cap has been placed onto the top of this structure by Lancashire County Council, to reserve its integrity. In 2013 it was recorded by Greenlane Archaeology as '*a short jetty of dressed stone construction, with four courses remaining, topped with a concrete skim'* (42).

3.65 Of interest are reports that in 1832 the remains of a dock was discovered in a small bay between Lindeth and Warton, receiving a rivulet from the east of called Quicksand Pool (HER PRN 520; Baines 1834 570). Correlation between

this dock and the quay at Site 2D is tempting, given that they both appear to be in a similar place. Baines describes the dock as a significant/large feature, covering about an acre in space (c.40m by 100m= 4000m^{2}) and being constructed of large quantities of timber and stone (Baines 1835, 570). Given the recorded size of this dock, it certainly cannot be the small quay at Site 2D. The acre space, which it reportedly covers, suggests a significant structure/operation. For comparison the early 19th century jetty at Hest Bank (Schofield 2010) covered 58m by 37m (2146m$^{2)}$ just over half the purported area of the dock exposed in 1832. Further research is required to determine if any additional reports of this substantial dock can be discovered, in particular to clarify its size and potential date/function. It should be noted that a later date of discovery (of 1848) is quoted in some newspaper articles (e.g. Westmorland Gazette 9th November 1850, 4) but given that Baines was writing in 1835 this must be an error.

3.66 It has also been suggested by Eadie (2012, 158) that the feature at site 2D may represent an access bridge across Quicksand Pool which post-dates the copper smelting site and was used in recent times as an access bridge onto the saltmarsh. Reviewing the text outlined by Eadie (ibid) it would appear that the possible jetty/quay (Site 2D) and the access bridge have been grouped as one site, especially given the stated measurements of the quay of c.24m is much larger than the exposed jetty shown in Figure 4.77 of this text.

3.67 The now collapsed steel and concrete bridge once provided access across Quicksand Pool, is located c.25m to the south-south-east of the quay/jetty (PRN 37067; Plate 28) and they appear to be unrelated. The access bridge dates to at latest 1960s at latest (probably 1930s) and provided access to the saltmarsh over Quicksand Pool for grazing (B. Holmes Pers. comm.). It collapsed sometime between 2000 and 2003 (P Iles pers. comm.. PRN 37067). A spread of rubble including limestone fragments (possibly including demolition rubble from the collapsed building at site 2B), machine made bricks (some marked 'CLAUGHTON MANOR', Greenlane Archaeology 2013, 42) and concrete fragments extends from the north-western edge of the bridge for c.46m up to the high point of the shore. This rubble spread formed a 'raised causeway' providing a stable access to the bridge. Some of the rubble has been lost/spread through erosion/coastal processes. Following the collapse of the bridge, P. Iles reported that the watercourse had moved significantly causing the saltmarsh on the northern side (around the chimney) to significantly erode.

3.68 The probability of the quay/jetty and access bridge being contemporary is unlikely given that the quay/jetty was buried beneath the saltmarsh until recently, whilst the access bridge was possibly constructed in the 1930s (Confer. 3.41). The quoted size of the jetty in NWRCZA (Eadie 2012, 158) of c.24m appears to be a mistake and is similar to the distance between the jetty/quay and access bridge.

3.69 The relationship between the possible jetty at 2D and the chimney site (sites 2A-C) is still to be determined.

4 Aims and Objectives of the Project

4.1 The aim of this project is:

- To record and investigate two sites of interest at Jenny Brown's Point as part of a community archaeology training/participation project

4.2 The objectives of the project are:

General

- To gather data to produce an accurate baseline record of the archaeological remains surviving at two sites near Jenny Brown's Point using a variety of survey techniques
- To train volunteers in techniques of site survey and recording
- To engage with and disseminate the results of the work to local community and visitors to the area (e.g. through site tours/open days, talks, leaflets)
- To record any evidence of erosion and/or new features bring exposed during the course of the project
- Produce illustrated reports detailing the results, a copy of which will be provided to the Lancashire County Council HER
- To archive the primary data and results with the appropriate repositories (e.g. local museum/archives, Archaeological Data Service)
- To develop a network of volunteers who can undertake survey and research following the conclusion of H2H

Site 1

- To investigate and record how much of the embankment survives into the Bay and how often are new sections exposed/covered over by the sands
- To explore the form and function of the L-shaped wall (?Jetty/quay/revetment) and its relationship with the embankment
- To investigate and record the brick/concrete/metal remains and whether they represent the 20th century bombing range and if so, how do they relate to those in the wider area

Site 2

- To investigate the function of the chimney (Site 2A; ?beacon, lime kiln, mining or copper-smelter) and (where possible) the date of construction, use and abandonment

- To explore and record the stone wall foundations (Site 2B) eroding out of the saltmarsh (Plate 16) and how they relate to the chimney situated directly to the west
- To investigate and record the walls/ foundations which curve around the southern edge of Sites 2A and B
- To investigate how the small ?jetty (Site 2D), situated to the south-west of the chimney, relates to the possible copper smelting site

4.3 The current work at the sites is designed to use the historical and archaeological background to identify gaps in the records. A staged approach to archaeological investigation is being delivered, which will help to compile a permanent record of the features, whilst exploring (where possible) their function and association with one another, together with research questions to be taken forward into the future.

5 Methodology

Overview of work 2014-6

5.1 Initial site visits were undertaken by Louise Martin on 11th and 25th June 2014, the latter accompanied by local historians Simon Williams and Andy Denwood (Plate 23).

Plate 23. Local historians Simon Williams and Andy Denwood inspecting the site around the chimney at Jenny Brown's Point, June 2014

5.2 Following these visits, Louise Martin and Simon Williams attended Silverdale Parish Council in September 2014 to ensure local knowledge of the proposed archaeology project at the earliest opportunity and address any issues that could impact on the project. A scoping study was produced by Louise Martin (Appendix 1) to use as a document to outline potential for research at the site and to liaise with the landowners/Lancashire Archaeological Advisor Peter Iles.

5.3 Further site visits were undertaken in January and March 2015 with consultants working on the documentary research project and in April 2015 with Sue Stallibrass (Historic England), Peter Iles (Lancashire County Council) and Megan Clement/Andy Sherman from the CITiZAN (Coastal Archaeology Zone Archaeology Network) North team (Plate 24).

Plate 24. Andy Sherman and Megan Clement (CITiZAN), Sue Stallibrass (Historic England), Simon Williams and Peter Iles (left to right) inspecting an eroded section of saltmarsh and possible hearth area at Site 2, April 2015

5.4 Digital photographs have been captured of all site visits and are currently stored on MBP's Central Dropbox under MBP Photos/Cultural Heritage/Jenny Brown's Point.

5.5 The initial phase of research at Jenny Brown's Point commenced in June 2015 and involved undertaking documentary research as part of a community-training programme. The results of this work are summarised in Section 3 and will be reported as a desk-based assessment (Martin et. al in prep). This training included a site visit with the volunteers on 21st June 2015.

5.6 In partnership with CITiZAN (Coastal Archaeology Zone Archaeology Network) a non-intrusive volunteer survey training/taster event was held on 19th and 20th June, introducing survey techniques such as tape and offset recording (Plates 25-26).

Plate 25. Megan Clement of the CITiZAN team showing volunteers how to undertake a tape and offset survey at Site 2

Plate 26. Volunteers undertaking a tape and offset survey of the building remains exposed at Site 2, looking south-west

5.7 Jamie Quartermaine, from Oxford Archaeology North (OAN), supported this survey by installing temporary survey stations (yellow survey stations-see Figures 3 and 4 Appendix 4 for location information) which were tied into the Ordnance Survey National Grid (Plate 27). An aerial survey of Site 2 was also undertaken with an Unmanned Aerial Vehicle (UAV; see Figure 5 and Plate 28).

Plate 27. Jamie Quatermaine of Oxford Archaeology North and Andy Sherman of CITiZAN setting up survey stations and demonstrating the use of a Total Station Theodolite, looking south-west

5.8 The results of the CITiZAN survey/training event were combined into a report dated April 2016 which is presented in Appendix 5. In addition, the site at Jenny Brown's Point was used to promote the launch of the CITiZAN project see https://www.youtube.com/watch?v=ziQM7LtpvEI.

5.9 Following the initial survey with CITiZAN/OAN further non-intrusive recording/training days were led by Louise Martin (MBP) assisted by H2H volunteers on 22nd-25th August, 19th-20th September and 3rd-4th of October 2015 (Plates 29 and 30).

5.10 The survey was limited to the remains exposed at Site 2B and was designed to record the exposed elements of the foundations.

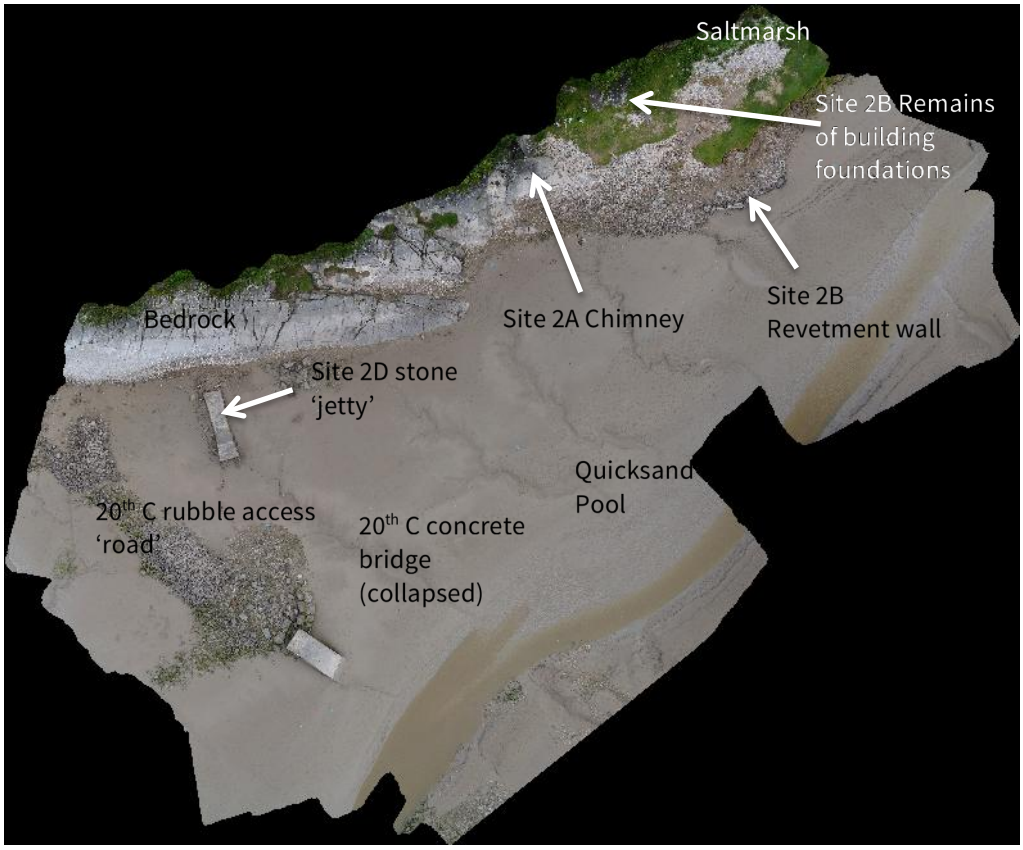

Plate 28. Aerial survey undertaken by Jamie Quatermaine of Oxford Archaeology North in July 2015 showing the features at Site 2

Plate 29. Volunteers undertaking planning at the site during August 2015

Plate 30. Volunteers examining and photographing the planned remains at Site 2 during August 2015

5.11 Further topographic survey was undertaken with Furness Mapping Services (FMS) on 15th December 2015 (using a Lecia Total Station) and 4th February 2016 (using a GPS) to record recent erosion noted at the site during the winter of 2015-6. The data collected from the survey is stored as an AutoCAD file and results of this survey are shown in Figure 6.

Plate 31. Furness Mapping Services undertaking a topographic survey to record extent of saltmarsh/erosion at Site 2, December 2015

5.12 With permission from the landowners (RSPB), the granting of SSSI consent by Natural England and assistance from the local coastguard, an aerial survey of Site 1 was undertaken on 31st March 2016 by Jamie Quartermaine (OAN). This survey was undertaken as part of the H2H built heritage-recording project and created a 2D image (Plate 32), a contour model and 3D model of the majority of the site. See Sketchfab for the 3D model https://sketchfab.com/models/b4e87864aeb1414aa76df7d6376ff892.

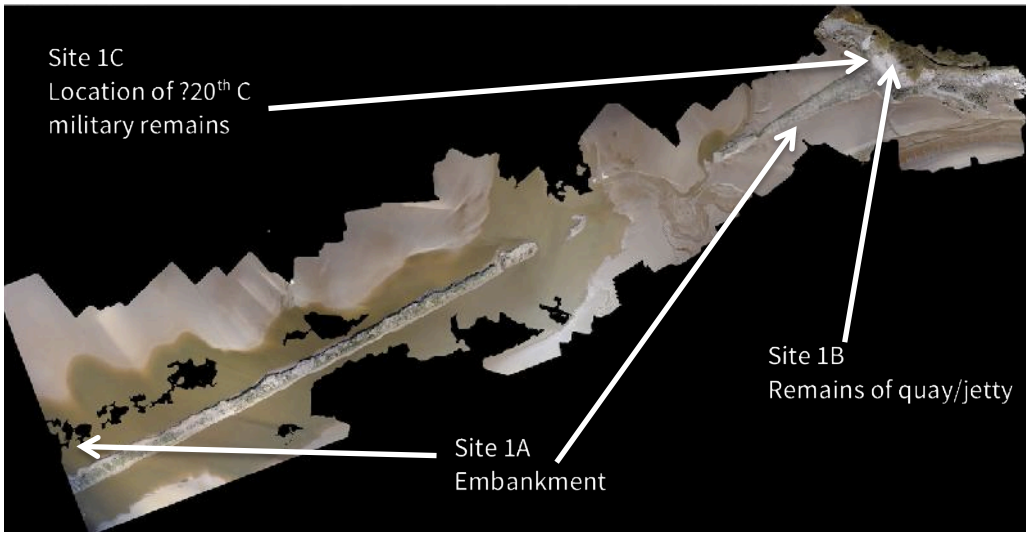

Plate 32. Plan aerial view of Site 1, captured by Jamie Quartermaine, Oxford Archaeology North- March 2016

5.13 The area around site 2 was photographed again from the air creating a 2D image (Plate 33), which highlighted the significant erosion/new channels that had occurred since June 2015 (Plate 34).

5.14 The methodology used for the surveys in presented below with the results presented in Section 6.

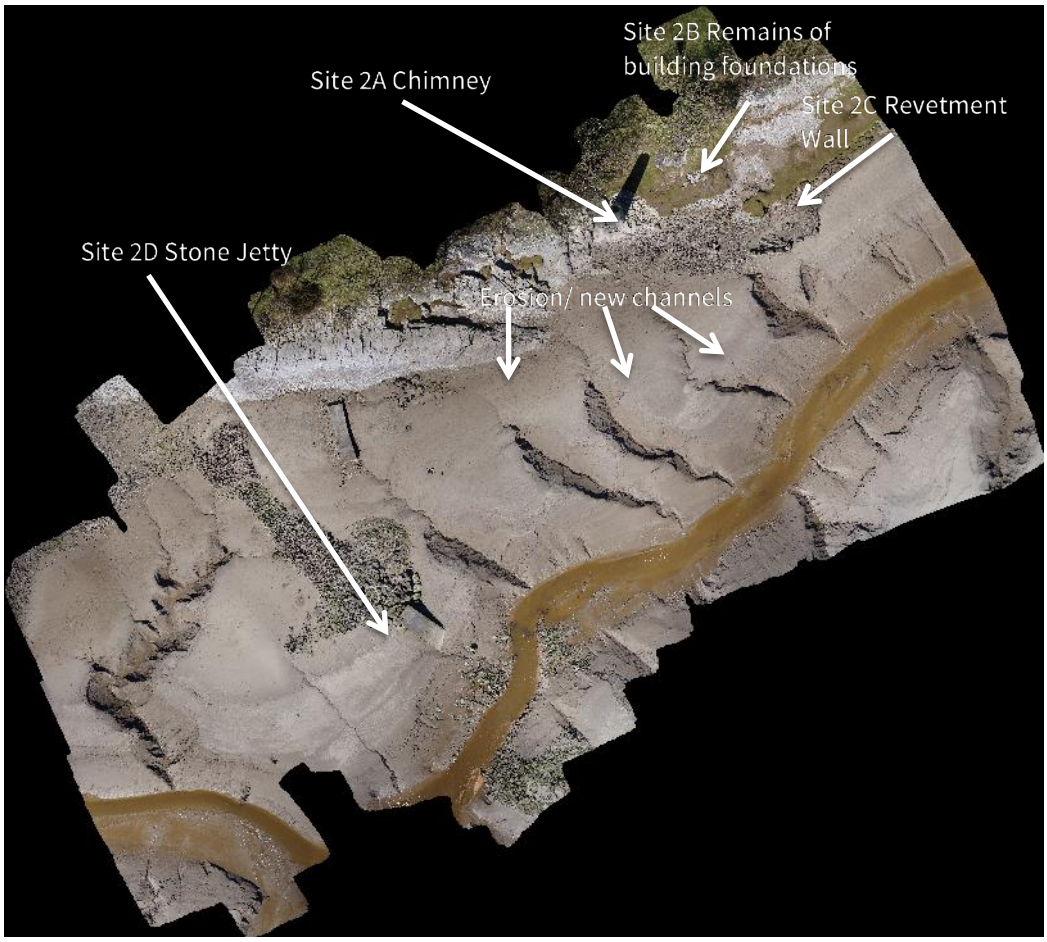

Plate 33. Plan aerial view of Site 2, captured by Jamie Quartermaine, Oxford Archaeology North- March 2016

Aerial Survey

5.15 The aerial survey was undertaken by Jamie Quatermaine, a CAA licenced pilot, using an Unmanned Aerial Vehicle (UAV) fitted with a 24 megapixel camera. The aerial survey was tied into the Ordnance Survey National Grid using a survey grade Global Positioning System (GPS) and Total Station Theodolite. The 3D model of Site 1 was created using photogrammetry using Agisoft.

5.16 SSSI consent was required and granted by Natural England for the aerial survey and the survey work was scheduled to minimise/mitigate impact to designated features in Morecambe Bay SSSI.

Topographic Survey

5.17 Oxford Archaeology North established two survey stations at Site 1 and four survey stations at Site 2. The location of the stations is shown in Figures 3 and 4, with a list of co-ordinates in Appendix 4. The stations were tied into the Ordnance Survey National Grid using a Total Station Theodolite and GPS. FMS undertook subsequent survey at Site 2 using a Leica Total Station Theodolite and survey grade GPS, using the survey stations previously

established by OAN.

5.18 The survey undertaken at Site 2 in December 2015/February 2016 mapped the site to enable the assessment of erosion.

Tape and Offset Survey

5.19 The majority of Site 2 was recorded by volunteers using tape and offset survey techniques using a baseline tied into the OAN survey stations.

5.20 A grid/base line was established at the west end of the site and survey grid measuring 5m by 5m were planned by hand at a scale of 1:20, using both tape and offset/planning frames to record all potential archaeological features.

5.21 Alongside the drawn record, a written record of the structural remains was recorded on a *pro forma* recording form, which forms part of the site archive. A list of the context numbers issues is presented in Section 6, Table 1.

Photographic Record

5.22 To complement the aerial and tape and offset survey a comprehensive colour digital photographic record of the site was captured. The photographs are currently stored on Morecambe Bay Partnership's Dropbox and a photographic database is currently being compiled. A copy of the photographs and database will form part of the final site archive. Louise Martin took the photographs presented below during the survey days in July to September 2015, unless otherwise stated.

Unstratified artefacts

5.23 During site visits/survey days/visits by volunteers a number of loose/unstratified artefacts have been collected from the site. A list of the objects is shown in Appendix 6. These were collected as they were vulnerable to being washed away by high tides/storms. Whilst they were found in spatial association with the chimney/building, given their unstratfied nature it is not possible to say that they have a secure association with this site. A bag of iron lumps/objects was also handed to Louise Martin by local resident B. Holmes and was reported as being retrieved from the vicinity of the chimney. These artefacts have been retained with the others-collected by MBP.

5.24 The finds are currently stored at Morecambe Bay Partnerships Offices, Aynam Road Kendal. These finds will be discussed with the local museum, but it is unlikely that the majority will be retained given their unstratified provenance.

6 Summary of Results 2015-6

Topography/site survey

6.1 The topography, aerial and hand-drawn plans have enabled a permanent record of the remains of Sites 1 and 2 to be made for inclusion in the Lancashire Historic Environment Record and as a permanent record of this site.

6.2 These surveys have enabled the sites to be accurately tied into the Ordnance Survey National Grid and form a baseline record to be used to monitor erosion, undertaken initial interpretation of the site, alongside develop proposals for further work.

6.3 The survey forms an integral part of the site archive, which is currently stored with Morecambe Bay Partnership on Dropbox.

Site 1 (Plate 32)

6.4 The aerial survey at Site 1 has captured a photographic record of the embankment, possible jetty/quay and probably later military structures.

6.5 It was, however, not possible to photograph the very south-western tip of the embankment given limitations of the distance the UAV could be flown from the operator.

6.6 Further, more detailed recording of the quay/jetty, north-western end of the embankment and possible military heritage feature is required to complete the record of the features in this area.

Site 2

6.7 The survey at Site 2 has been more comprehensive that that undertaken at Site 1, with at nine days of volunteer recording days complementing the aerial and topographic surveys undertaken by OAN/FMS. The planning/site investigations have concentrated around the eroding building foundations (Sites 2B and C; Plates 34 to 40), in addition to the possible jetty (Site 2D; Plates 42 to 45) to the south-west of the chimney.

6.8 During survey/planning the volunteers noted a number of features, including evidence of possible phasing and metal objects, which are noted in the site description below.

6.9 The aerial survey and site plans have been used to create an initial plan of the site (Figure 6). Stones possibly associated with the building have been highlighted in black, to enable initial interpretations to be presented. It is likely that some of these stones are not part of the foundations, but rather represent tumble/demolition rubble. It is hoped that further work on the site will help define the building foundations and the plan will be updated to reflect further interpretation.

6.10 Due to only part of the building foundations currently being exposed, the results are presented by context in Appendix 7.

6.11 The following text provides a summary of the features recorded at Site 2. At present phasing, associations and interpretations are difficult given the fragmentary nature of the remains exposed. Further targeted survey following erosion cycles and/or excavation may reveal more/additional elements of the structure enabling this recorded to be updated and enhanced in subsequent years. It is intended only as a preliminary record/report of the results at this stage.

Site 2A

6.12 The primary and most dominating feature at Site 2 is the stone chimney (Site 2A; Feature **026**), which stands to c.12m in height and measures c.2m in diameter. It has not currently been recorded in detail as part of this project, although observations made during the survey of Site 2B are described below.

6.13 The chimney appears to have been constructed directly onto an outcrop of limestone bedrock and sits on a base of at least two courses of dressed limestone blocks (Plate 34). A further c.50 courses of limestone blocks (recorded from photographs) form the main circular chimney.

6.14 An opening is visible on its eastern side, located between course one to five. The sixth course includes a stone lintel. This opening measures c. 0.9m by 0.55m (Plate 34).

Plate 34. Lower elevation of Chimney 026 showing the east-facing opening and foundations 021/021

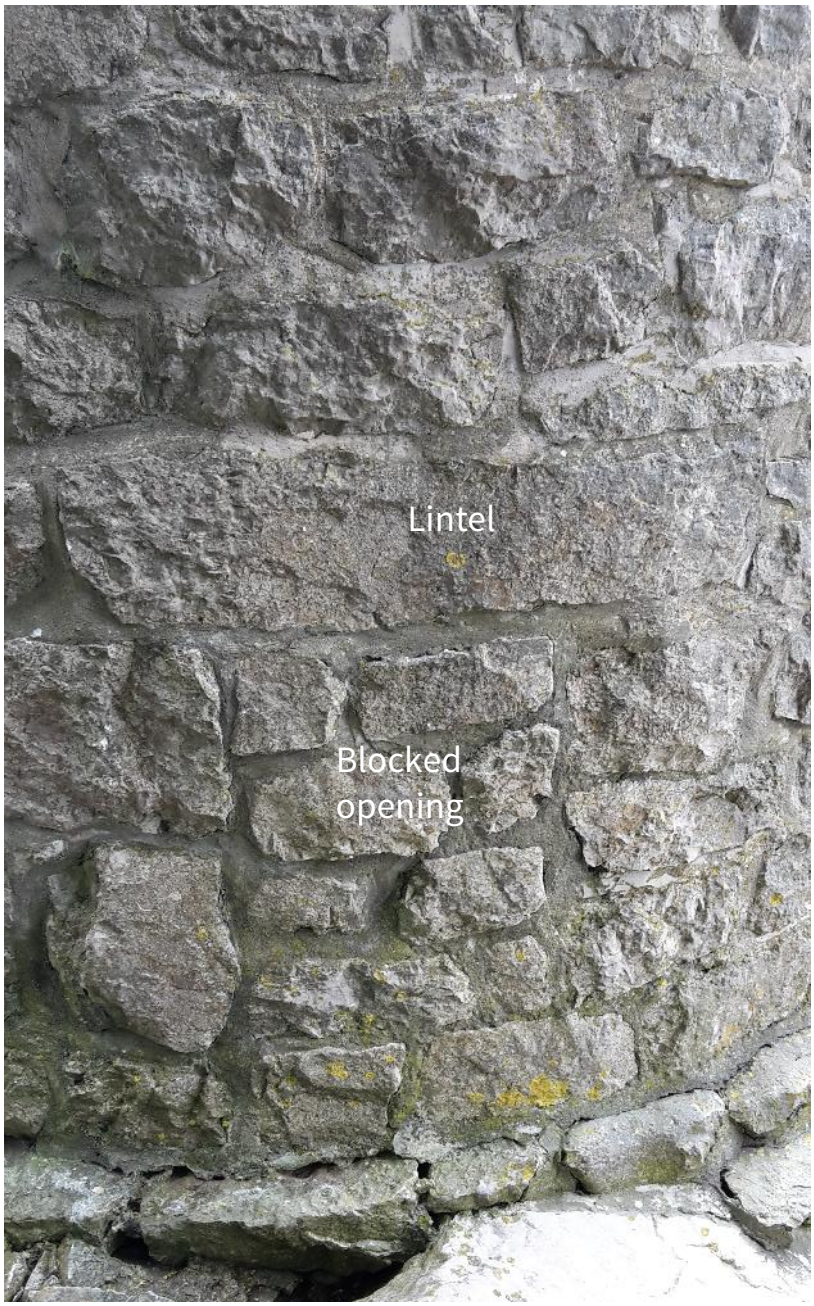

Plate 35. Lower elevation of Chimney 021 showing blocked western opening and foundations 021/021. Photograph by Claire Asplin

6.15 Inspection of the west facing elevation of the chimney, in July 2015, following discussion with local resident B. Holmes, revealed an opposing entrance which had been blocked up. The lintel can clearly be seen within the elevation of the chimney, which has similar dimensions to the one in the eastern-facing elevation (Plate 35).

6.16 B. Holmes recalls this opening being blocked up during the repointing undertaken by Lancashire County Council in the 1980s (Pers. comm.). Although Cuthbert Woods states that there was an opening on the landward side and a similar opening on the opposite site, which has 'been built up' (1946, 173.)

6.17 Around the base of the chimney and to the northern edge a deposit of charcoal/coal/charred peat, contained within concrete/mortar was observed. This deposit was rapidly recorded as deposit **022** (Plate 36) and requires further investigation to establish if it is associated with the use of the chimney.

Plate 36 Coal rich deposit 022 observed to the north of the chimney 026, looking south. Photograph C. Asplin

Site 2B

6.18 Extending from the base of the chimney to the east were two linear arrangements of foundations (**020**/**021, Plate 30**).

6.19 Foundations (**020)** were noted to extend from the chimney for c.4.4m and comprised one course of unbonded and roughly hewn large limestone blocks, which had been combined with outcropping limestone bedrock. They appeared to form a wall, up to 0.75m in width, which extended from the chimney to the south-east, possibly abutting wall 001. Located c.1m to the north, foundations (**021)** were observed. They extended for a distance of c.2.9m from the chimney to the east, where any continuation was concealed by limestone rubble (**010**). Only one course, c.0.40m in width was observed in plan. Due to the amount of limestone rubble in this area these foundations were difficult to define in some areas.

6.20 To the south-east of the chimney a number of wall foundations (**001A and B, 002-006**) are being revealed as the salt marsh around them erodes (see Plates 37 and 38). Given their fragmentary nature, it is difficult to establish their exact form, function and size. Relationships/continuations of features can be postulated in some features and are discussed below. The dimensions (where recorded) of these features are shown in Appendix 7. Unless

otherwise stated all features described are formed from roughly dressed limestone block of varying sizes.

6.21 Foundations (**001A)** appear to butt and/or extend from the eastern end of foundations (**020)**. This wall junction is also in line with the foundations of possible revetment wall (**014)**, located to the south-east.

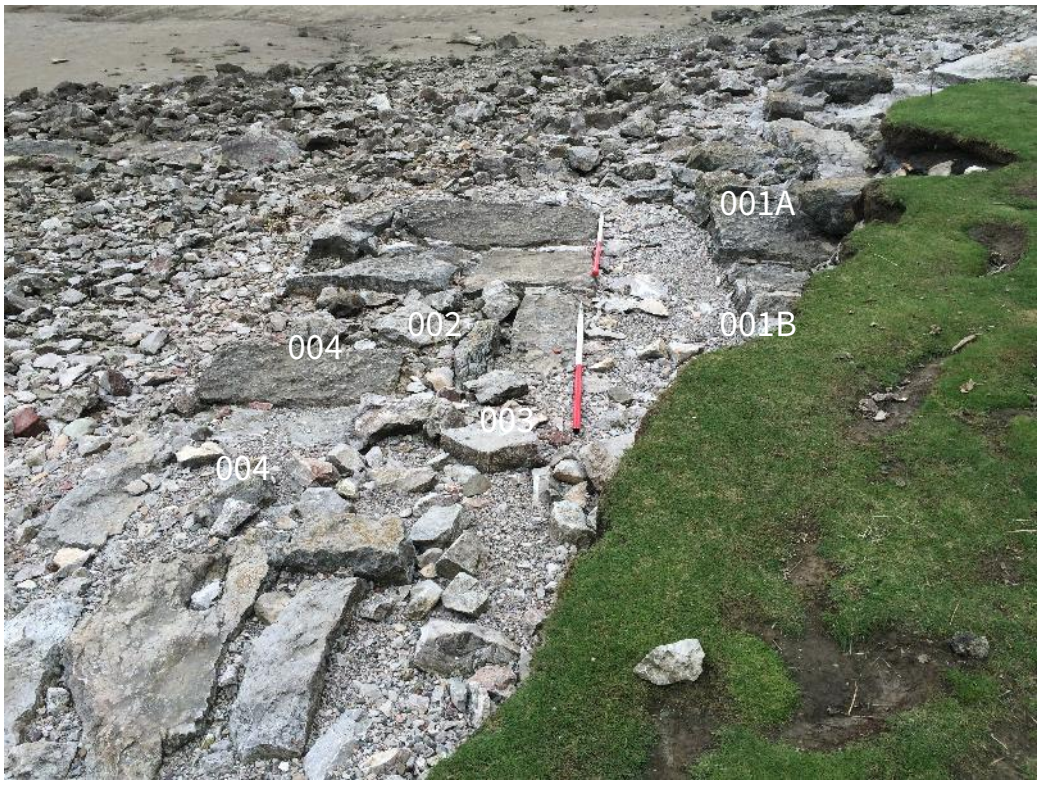

Plate 37 North-east to south-west aligned wall foundations, noted to the south-east of the chimney, looking south-west

6.22 In plan Wall **001A** (CITIZAN 101) extends for c.2.8m, where it appears to butt/and or continue as (**001B)** (CITiZAN 100)**.** Foundations (**001B)** appears to be wider than (**001A),** up to 1.4m versus 1.00m in width, and corresponds to the end of wall 002/003. They extend for 2.4m, at which point they are obscured by the overlying deposits/saltmarsh (**009/CITiZAN 201**). Projection of the alignment of this wall indicates that it may continue to the north-east as foundation (**005,** confer 6.25).

6.23 Foundation **(002)** is located c.0.60m to the south-east and runs parallel with (**001B)**. It measured up to 5.09m (exposed) in length by c.1.5m maximum in width. This foundation was recorded as a number of separate features (**002-004**) and a gap (recorded as **004**) may be significant and requires further investigation. The area between and around foundation (**001B)** and (**002)** was filled with small fragments of limestone (**010**).

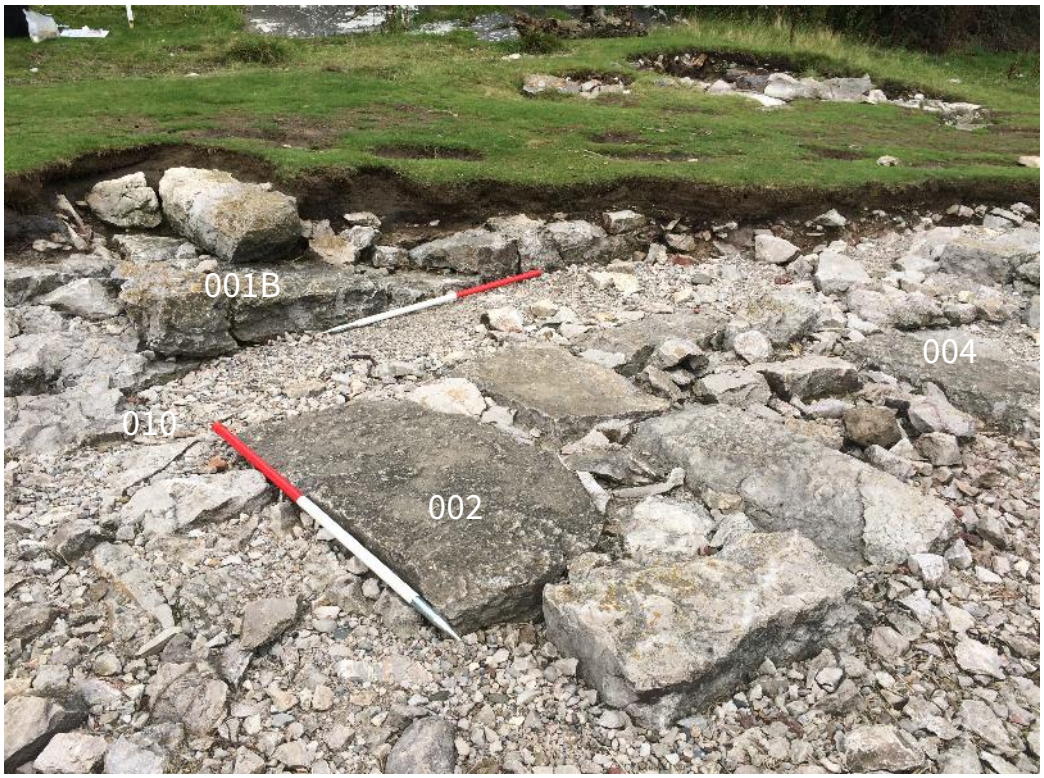

Plate 38. Wall foundations 001B and 002/004, looking north

6.24 The only other elements of the foundations exposed were visible in an erosion scar in the surface of the saltmarsh c.5m to the north-east of the point where 001B, 002-004 disappear beneath the saltmarsh (Figure 6).

6.25 Foundation (**005**), may be a continuation of (**001B**). The north-western edge of this wall was faced and was exposed for 1.8m in length by 1.22m in width, measuring up to 0.11m in depth (Plates 39 and 40).

Plate 39 Wall foundation 005 and 006 and possible 'hearth' area, looking north

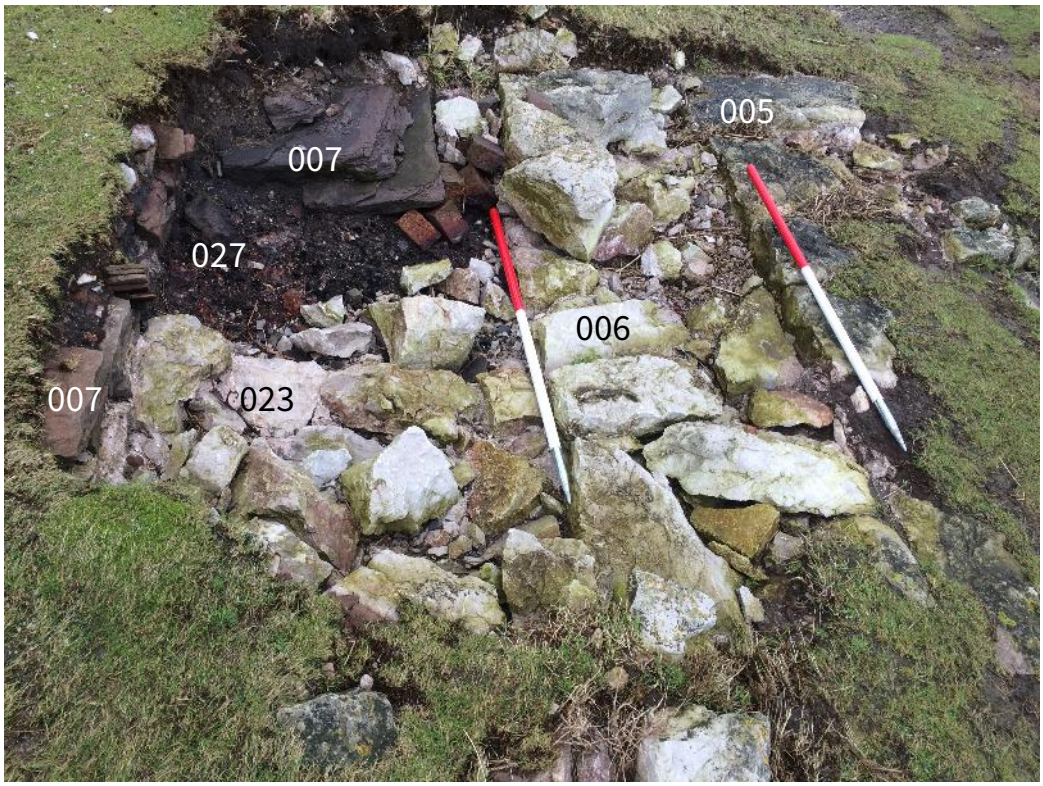

Plate 40 Wall foundations 005, 006 and 023, and possible hearth area (007/027)

6.26 Foundation (**006)** abutts the north-western face of (**005)** and was exposed for c.3.4m and measured 0.85m in width. It appeared to have utilised the edge of (**005**), only being faced on its north-western edge. This suggests that this foundation was a later insertion. Some of the limestone blocks forming this feature were reddened indicating exposure to heat.

6.27 A possible partly exposed foundation (**023**) was observed abutting wall 006, however, further work is required in the area to determine its full form/extent/relationship with surrounding features. This appeared to be overlain by slabs of sandstone (**007**), which were observed in plan and in section. It is likely that 007 comprises more than one context, possibly sandstone flags and an in situ wall (D. Cranstone, Pers.Comm) and requires further investigation.

6.28 Contained within **006** and **023** was a charred, charcoal and slag rich deposit (**027)** which possibly forms part of a hearth/fire pit/stoke hole. Firebricks were observed within and loose around this deposit. This appears to possibly have been capped by sandstone flags (**007**), which appeared to have been heat affected. This is a complex area of the site and further investigation is likely to reveal more contexts/deposits to be recorded. Further investigation is required, in particular focused on the stratigraphic sequence, form and function of this area of the structure.

6.29 To date no sections have been recorded in any detail but rapid assessment indicates that a layer of possible demolition rubble (**012** and **013**) seals some of the building foundations, which is in turn overlain by a dark brown black

loam (**012)** and the grass of the saltmarsh. (**009**)

6.30 The area around the chimney and within and to the south of the building foundations is covered with fragments of limestone (**010**) of various sizes, which appear to overly natural estuarine mud deposits (**011**). Further work is required to record this deposit in detail and establish if it is one or a number of deposits and whether it is demolition rubble and/or a base onto which the buildings were constructed.

Site 2C

6.31 To the south of the building foundations and contained within deposit (**010)** elements of a possible curvilinear wall foundation (**014-018,** Plate 41-42) stand extant. Elements of structure (**017**) were previously rapidly recorded as part of the NWRCZA and were interpreted as a jetty associated with the chimney (Eadie 2012, 156). Close inspection during the recording work undertaking in 2015 revealed that the feature extended further to the north-west and east and possibly forms a revetment wall rather than a jetty. This survey work also identified at least two and possibly three separate phases of this structure, although further work is required to fully understand phasing and relationships and hence the description below includes only suggests phasing.

6.32 Possibly the earliest element of this feature is represented by a short section of foundations (**018**) which are on a north-west to south-east alignment and extent for at least c.3m in length by c.0.60m in width.

6.33 Located c.5.8m to the east of (**018**) is a short length of curvilinear foundations (**026)**, which was only noted from the aerial photograph. It measures c.2.4m in length by c.*0*.25m and may represent a continuation of (**018**) or perhaps an earlier phase.

6.34 Context **(019)** has been allocated to an L-shaped arrangement of foundations, which could be associated with (**018)**. At its western end it is obscured (overlain/post-dated by (**017**) which has made establishing relationships at this time difficult, however it does indicate a second phase of walling in this area.

6.35 Currently walls (**014**-**017**) have all been grouped as part of the same phase of walling, although direct stratigraphic relationships have not been established and the phasing is based on spatial relationships. Together they form a curvilinear boundary with the north-western limit defined by (**014/015**). Only once course (0.05-0.13m) of foundation (**014**) was exposed which extended/was exposed for c.3.6m and measured c.0.4m in width. Some of the limestone blocks forming (**014**) included evidence of metal fittings, which may either be metal ties into a now lost upper course or where a metal railing was located. Towards its eastern edge a second course of larger limestone blocks, measuring 1.55m in length up to 0.49m in height was given a separate context number (**015**), although is believed to be part of the same feature as (**014**). Of interest are two large blocks observed to the north,

which may be a possible collapsed upper course. Examination of the aerial photograph (Plate 42) shows a line of rubble extending from these limestone blocks (not currently recorded) and warrants further investigation to determine if it is a further feature.

6.36 A gap of 2m was then noted between (**014/15**) and a single isolated stone (**016**), on the same alignment, represents the probable continuation of this wall. A further gap of 1.2m was noted between (**016**) and the most substantial element of this structure (**017**). Measuring c.6.2m in length by up to 0.70m in width and up to 1m in height wall (**017**) comprised two courses of large limestone blocks (Plates 41-45).

Plate 41.Wall foundations 017 (foreground) showing relationship to chimney site, March 2017, looking north-west

6.37 It is unclear if there are foundations beneath the blocks forming wall (**017**) and whilst on a similar alignment to (**014**, **015**, **016**) the difference in construction may suggest a different phase and/or use of this part of the structure. It certainly seemed to post-date **018**.

6.38 Since starting survey work at the site in 2015, a large channel has opened up to the immediate south of wall (**017**) following storms in the winter of 2015/6 (see Plate 45).

6.39 Targeted work is required to record/study these foundations and their relationships in more detail as only an overview is presented at this stage. This work is critical given the continued erosion of the site.

Plate 42 Aerial plan view showing the possible revetments walls 014-019

*Plate 43. Ranging poles define the north-western end of (**014**) left, wall (**015**) (centre) with wall (**017**) to the right, August 2015*

*Plate 44. Ranging poles define wall (**015**) left, wall (**017**) (centre), August 2015*

Plate 45. Wall 017 showing the deep channel that had opened up in front of the structure during the winter of 2015/6. February 2016

Site 2D

6.40 A stone (**100**) and concrete (**101**) structure located to the south-west of the chimney was rapidly recorded in 2015. It comprises limestone blocks which vary in size from 0.14m to 0.72m in height by 0.04-0.33m in depth. It measures 8.45m in length by between 1.7m-2.6m in width (it tapers/narrows in the middle where it is only 1.7m in width). The top of the structure is capped with a layer of modern concrete (**101**) c.0.07-0.13m in depth which the HER records was put in place in recent years to preserve the feature, following its exposure from the salt marsh.

*Plate 46. Western elevation of possible jetty/quay (**100/101**) with the chimney (**026**) in the background, looking east. March 2015*

Plate 47. Southern elevation of the possible jetty/quay (100/101) at Site 2B, March 2015

Plate 48. South and east facing elevations of the possible jetty/quay at Site 2B, March 2015

Plate 49. Volunteers recording the eastern elevation of the possible jetty/quay (100/101) during August 2015

Finds Analysis

6.41 Loose/unstratfied objects, which were found in the vicinity of the area were collected during the onsite survey and a summary of the material is presented below and in Appendix 6. The majority of finds were recovered from the surface of deposits (**010**) and (0**27**) but they are discussed by relationships to nearby features. All objects/bags of objects have been given a unique ID (e.g. 1/15), which denote the object number and date when collected.

6.42 All finds identification has been undertaken by Louise Martin, apart from a sample of ores/slags which have been submitted to Dr Gerry McDonnell for XRF analysis. If the object has been analysed and reported as part of the XRF analysis it has been given another unique number (e.g. JBP 4.1). XRF analysis was undertaken at this stage to give an indication of what industrial processes may have been undertaken in and/or around the building. Both iron and copper ores were present within the assemblage, as well as copper slags. The full report is presented in Appendix 8

6.43 Further work is required, in particular collecting stratified material, to determine what processes (copper smelting and/or iron smelting) were undertaken at the site. The recovery of stratified dateable material, such as pottery and in some instances brick may assist in dating the construction and/or use of the site.

Foundations 001 A/B and 004

6.44 A fragment of copper ore (10/15, JBP 3) was retrieved from the vicinity of foundations (**001A/B**, whilst an iron chain/link was collected from near (0**04**). Both objects were from the surface of rubble deposit (**010**).

Deposit 010

6.45 A number of objects were collected from the limestone rubble deposit, which surrounds Sites 2A, B and C. Where they were not near to a feature they have just been recorded as located on the surface of (**010**). These surface finds included an iron nail (9/15), a possible copper/lead button with lettering (11/15), a conglomerate possibly containing an iron object (13/15), a fragment of copper ore (12/15, JBP 1.1), iron slag (6/16) and coal fragments (18/15)

Deposit 011

6.46 A iron object (5/16) was retrieved from the surface of estuarine deposit (**011**), to the east of wall foundations (**005**).

Deposit 012

6.47 A fragment of an iron object/piece of slag (16/15) was retrieved from deposit (**012**) to the north-west of the hearth area, towards the field boundary.

Foundations 014

6.48 An iron object attached to a piece of limestone (15/15) was recovered from the vicinity of foundations 014, on the surface of deposit (**010**). Given that similar stones formed part of the foundations of (**014)**, it is possible this is a disturbed/collapsed part of this structure.

Chimney 026

6.49 A number of artefacts were located within the immediate area of the chimney, lying on the surface of rubble deposit (**010**). These included a fragment of iron ore (5/15, JBP 6), an iron nail (7/15), two sherds of possible post-medieval pottery (8/15 and 3/16), a collection of thirteen objects (6/15) which included a fragment of iron ore (JBP 7.4) of different composition to JBP 6, three samples of grey/black iron slag (JBP 7.3, 7.6 and 7.7) and four iron metal objects with adhering slag or clinker (JBP 7.1, 7.2, 7.5 and 7.8) which could be part of a furnace/hearth structure or damper. Two firebricks were also recovered 4m to the south of the chimney (20/15).

Deposit 027 (possible hearth)

6.50 In the immediate vicinity and within deposit 027 a number of objects were retrieved which include a copper ?rivet (1/15), copper ores (2/15, JBP2 and 4.2) a metallic droplet with copper, zinc and lead content (2/15, JBP 4.4), iron slag (4/16) and coal (2/16).A firebrick (21/15, JBP 8) had also come loose and was collected from the vicinity of deposit 027.

6.51 Most interestingly, a fragment of clinker (1/16, JBP 5) was recovered from the vicinity of deposit 027 and the XRF analysis has indicated that is similar to a slag generated in a firebox from a steam engine (McDonnell 2016, 7).

Other

6.52 A bag of material containing an iron conglomerate (4/15), possibly an iron bar, was submitted by a local resident who informed Louise Martin that it was found within the vicinity of the chimney. This object would warrant x-ray to determine the content within the conglomerate.

7 Discussion, Conclusions and Recommendations

7.1 The survey work detailed within this report and undertaken by volunteers has enabled a start to be made on recording and investigating the archaeological remains around Jenny Brown's Point. Whilst these sites were previously well known and had been identified through previous research including the NWRCZA, detailed records had not been made of the archaeological remains. The record captured during 2014-6 has enabled the creation of a permanent photographic record of these structures and has brought together available archive data to enable the historical background of these sites to be understood. It has also enabled volunteers to gain skills in archaeological survey and recording techniques, which will be built on during the remainder of the Headland to Headspace Scheme to understand these sites further.

Site 1

7.2 This is a difficult site to record, due to its size and location (extending into intertidal muds with known quicksand around the embankment. In addition the site is within Morecambe Bay SSSI and hence survey (in particular aerial survey) is restricted to certain times of the year to mitigate any distance to nationally important/protected birdlife.

7.3 The aerial survey undertaken during March 2016 has enabled the majority of the remains of the late 19th century land reclamation scheme (Site 1A) to be recorded. The record can now be used as a baseline survey to investigate/examine the site in more detail and contrast it to other aerial surveys to map coastal processes/erosion. It would be beneficial to repeat this survey, firstly to capture the south-western tip of the stone embankment which was excluded from the recent record, and to ascertain how much the site is changing over time.

7.4 The historical background of this structure has been well researched and documented by local historians (e.g. Williams 2014 and 2015), however, further work on archive material may embellish the record for this site.

7.5 The large L-shaped jetty (Site 1B) requires further detailed recording and investigation. The date and function of this feature is currently unknown, however, it is recorded in the HER as being contemporary/associated with the embankment. Historical research of records relating to the construction of the embankment could possibly hold important information/detail relating to this structure and could be examined for this reason.

7.6 Of interest is 1848 first edition Ordnance Survey map (Plate 3) that shows an L-shaped feature to the immediate right of the 'Jenny Brown's Point' caption and could possibly represent the jetty. This mapping also shows a small recliner structure, which may possibly be a summerhouse recorded in the tithe apportionment (No.74 on the tithe map; Plate 15), which was owned by Paul Henry Fleetwood. By the 1892 Ordnance Survey mapping (Plate 6) the embankment and the L-shaped jetty are clearly visible, along with the rectilinear structure seen on earlier mapping. An L-shaped feature is also

visible to the north.

7.7 Given the size and precarious condition of the structure at Site 1B it is recommended that recording is undertaken using photogrammetry. The aerial survey captured can be used as a basis for further work. It would also be beneficial to determine its relationship with the stone embankment (Site 1A).

7.8 There may be some scope in undertaking more work on landownership and analysing archives/shipping records for the area to determine the date of the quay/jetty and what cargos it may have been handling.

7.9 The form of the brick/concrete remains that are located on the north-eastern tip of, and appear to post date, the embankment (Site 1C) indicates they are of more modern construction. They may be associated with military structures that were known to have occupied this area and again further research is required to determine the date and function of these remains.

Site 2

7.10 Whilst the chimney site (Site 2A) has long been discussed in publications (see Section 3), coastal erosion in the 1980s and reduction in the extent of saltmarsh led to a number of features being exposed that has previously been buried/concealed. These include the remains of a structure to the east of the chimney and a possible jetty/revetment wall (Sites 2B and C) and a possible jetty positioned c.50m to the south-west of the chimney (Site 2D). The recent survey and investigations undertaken at the site have enabled the remains exposed to the east/south east of the chimney to be better recorded and understood, enhancing the Historic Environment Record, although many questions remain unanswered.

7.11 Both the Tithe map and the First edition Ordnance Survey mapping (Plate 16) indicate that the chimney and the foundations being revealed through the eroding saltmarsh at Site 2B are part of one structure, joined together by a narrow ? flue. Going forward this site should be investigated as a unit, with the stratified deposits/structures preserved beneath the saltmarsh possibly holding answers to the function of the enigmatic chimney, which has long been debated.

7.12 The survey identified two walls (**020/021)** extending from the eastern side of the chimney towards the building foundations (**001A/001B** and **002-004**). Whilst some wall foundations are clear, the significant amount of limestone rubble in this area may be masking the continuation of these foundations and requires further work. Walls (**020/021)** correspond to a linear feature (flue?) shown on the historic mapping (Plate 16) connecting the chimney to a rectilinear building Historic photographs (e.g see image on Cuthbert Wood p.175 and Plate 18) show that the northern wall (**020**) was at least the height of the chimney opening. It is expected that this possible flue would have been covered in some way.

7.13 The wall foundations at Site 2B (**001A and B, 002-006**; Plates 37 and 38) are

currently difficult to understand, given the sporadic and fragmentary nature of what is exposed. Their exact form, function and size, remain unanswered, however all the foundations appear to relate to the rectilinear structure shown on the historic mapping (Plate 16) and as a partially demolished structure in Plate 18. Despite only being partially exposed, it has been possible to postulate continuation of features (see Figure 6), suggest relationship and in some case phasing e.g. wall (**006)** post-dating (**005**). Any further work at the site should aim to establish the extent of the exterior of the structure (length and width) alongside exploring its interior, in particular the structure around the possible 'hearth' (**007**/**023**/**027**). Burnt deposits, firebricks and slags/vitrified surfaces (currently recorded under deposit **027**) are evident to the north-west of wall 006 and appear to be the remains of a hearth/fire pit, which may have been sealed with sandstone flags (**007**). One interesting object retrieved from this deposit includes clinker that has been identified as a clinker possibly generated from the firebox of a steam engine (McDonnell 2016, 7).

7.14 The main line of research for the structures at Site 2A and 2B is what function they served and what process(es) were being undertaken at the site. An industrial function, in particular involving the smelting of copper is the primary interpretation and as such has been the focus of background research to date. The volunteer team researching the site have investigated the processes of copper smelting and type of structures that would have been used for them. Given that Tom Bolton records a Welsh connection with the smelter at Jenny Brown's Point, some of this research focused on the Welsh copper industry. The primary aim of this research was to determine if any similar structures to the outline suggested by the remaining chimney/foundations at Jenny Brown's Point could be identified and to determine what type of structures/residues would be left behind from such a process. It included examining 19th century texts (e.g. Grant-Francis 1881, Lamborn 1860) and diagrams of copper smelting furnaces. In addition, David Cranstone, Industrial Archaeologist attended a special workshop in July 2016 designed to explore the data collected to date and where research could be taken forward in the future.

7.15 Extraction of metallic copper from its ores is usually undertaken by smelting. This involves heating the ores to a sufficient temperature and in a reducing environment (one rich in carbon monoxide rather than oxygen) to separate the metallic copper from the other minerals (gangue) within the ore.

From the late 17th century, reverberatory furnaces were being used for smelting copper and it has been proposed that the site at Jenny Brown's Point could have been a reverberatory furnace. In this type of furnace, the fuel and ore are kept separate in different chambers during the smelting processes. A fireplace/hearth would be at one end, which was separated from the ore to be treated by a low wall. A chimney would provide a draught by which the heat from the fire would be drawn across the ore (Lamborn 1860, 106-7 and Historic England 2015, 42). A low roof would reverberate/reflect the

heat back down onto the ore. The benefit of this type of arrangement is that coal rather than charcoal could be used (a cheaper fuel) and that the atmosphere of the furnace could be changed (from reducing to oxidising) by opening closing doors and vents (Historic England 2015, 42). In practice there were several successive roasting and smelting cycles (generally characterised as the earlier Bristol and later Welsh processes, including heating in oxidising conditions to remove as much of the sulphur as possible, which would produce a 'calcined ore' Melting of the calcined ore in the smelter would produce a slag and a matte (mixture of copper and iron sulphides). The calcined stage would be repeated with the matte, with the matte being melted. Each stage of the process would produce a slag, where impurities within the ore would be removed. By repeating this process pure copper would be eventually formed (Historic England 2015, 42).

7.16 The slag and metallic copper would be collected in the slope of the hearth at the breast, where they would be tapped off (Danford 1912).

7.17 An example of a schematic cross-elevation of a reverberatory furnace is shown in Figure 7 and demonstrates how much of the fabric of the structure would have been above ground and the location of the fuel hearth/ash pit to collect waste material.

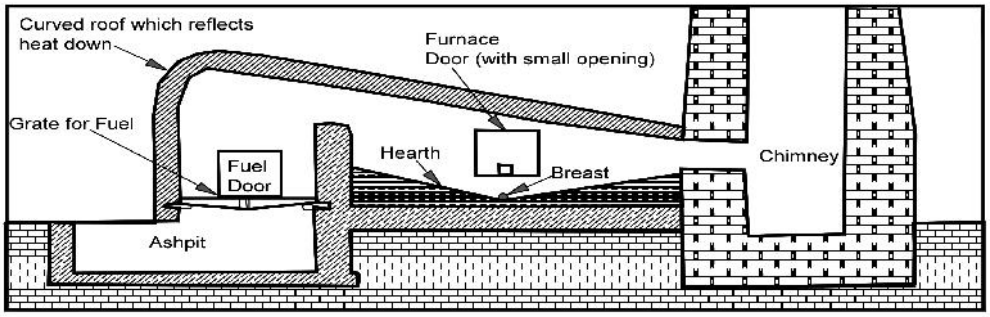

Figure 7. Schematic cross-elevation of a typical reverberatory furnace for copper smelting (Figure adapted by Louise Martin from Fig. 10, Danforth 1912)

7.18 If the structure at Site 2B is a reverberatory furnace, how do the features exposed correlate to the plan shown in Figure 7? The nature of deposits and evidence of heat affected materials to the north of walls 005/6, deposit 27 and flags 007 indicate this could be a hearth/remains of a furnace. As such, if this site conforms to the standard plan of a reverberatory furnace a sunken ash pit would be expected to the north-east and a flue leading to the chimney to the south-west. The area to the north-east is currently beneath the salt marsh, with only partially exposed foundations exposed to the south-west. It is possible that walls 001 and 004 are forming a flue, which together with 020/021 lead to the chimney.

7.19 The arrangement of structures shown on the Tithe/Ordnance Survey maps in

this area, a rectilinear structure with an angled narrow structure (?flue) leading to a circular structure (chimney), however, does not correspond to the typical examples of reverberatory furnaces seen to date, which appear to be linear rectangular features, longer than they were wide (Historic England 2015, 42).

7.20 So if the structure is not a reverberatory furnace what other evidence of its function exists? One possibility, which has been proposed, is that it is a pumping house for a mine. The buildings shown on the 1846 Tithe map in this area are labelled 'Mining Shaft', possibly lend some credence to this idea. Unfortunately, the land containing the site is only recorded as 795 'roads, rivers and waste'- (see Appendix 3) so there is no further information on landownership or description of the plot in the accompanying Tithe Apportionment. The Tithe Commissioners sought a high standard for maps produced and an Act was introduced in 1836 that a map should not be treated as accurate unless it was sealed and signed by the Commissioners (National Archives 2017). Whilst agricultural land and features , which were 'titheable' are normally highly accurate, industrial features were not 'titheable' and may not have been mapped to the same accuracy (D. Cranstone, pers. comm.).

7.21 The cylindrical chimney at Site 2 does bear some resemblance to those associated with mine pumping houses. A rapid online search has found many such sites survive in Cornwall e.g. Cornish Mining World Heritage 2017a, Jones 2017, however the associated pumping engine house, appear to be large/ tall structures, which would have housed a beam engine. The architecture of the Cornish examples is distinctive and would have included a boiler house and chimney alongside the pumping house (Cornish Mining World Heritage 2017b). The site at Jenny Brown's Point does not appear to replicate this plan, but there is a possibility that a simpler design was used and further research is required into mine buildings/pumping houses to investigate this theory further.

7.22 One question which has been asked by many researching the site is why position a mine on the shore/ low lying area, where it would be subject to flooding? By the mid-19th century when the Tithe map and first edition Ordnance Survey maps were produced, the site is very close to the shore. But perhaps this had come about through the natural cycle of erosion and deposition of the saltmarsh, constantly in action in Morecambe Bay. It is well documented that the Bay's channels are dynamic, shifting orientation and influencing the erosion and expansion of the coastal salt (Adam 1990, 29 and Arnside and Silverdale AONB et al 2015, 23). Movement of the Kent channel during the 1970s has led to the continued erosion of the saltmarsh at Jenny Brown's Point, revealing may of the features discussed in this report.

7.23 Perhaps, when the chimney and its associated buildings were first constructed the site was some distance from the shore, making tidal flooding less likely? Again this is a question, which requires further consideration and investigation (where possible) in particular into saltmarsh erosion patterns

including the work conducted by Dr Ada Pringle (Lancaster University) on the erosion of the Silverdale saltmarsh.

7.24 Evidence of possible encroachment of the sea towards the site, may be found in the possible foundation/wall forming Site 2D. The large stone blocks (**017**) to the south of the building foundations have previously been interpreted as a possible jetty, however, during the hand drawn survey a number of apparently associated walls (**014**-**016** and **018**-**019**) were identified which led the team on site to consider an alternative function to this structure. Together the walls appear to curve from the end of wall **002**/**004** in alignment with the end of foundations **020**, possibly providing a boundary/revetment to define the southern extent of the site. Rapid examination of the walls appeared to indicate that a number of phases (at least 2 perhaps 3) were present and that the earliest phase comprised smaller limestone blocks, which became larger in subsequent phases, culminating in the large stone blocks forming wall **017**. Of interest is that some of the stone forming part of the western feature (**014**) had evidence of metal fittings, which may have once supported metal railings or held an upper course of stone in place. One explanation for this increase in the size of this wall that it provided increased protection for the building to the north. This possibly provided cover from the wind or alternatively could it have been expanded to protect the site from the encroaching channel/sea. Could the postulated expansion of the revetment wall be associated with erosion of the saltmarsh during the late 18th, early 19th century and an attempt to keep the sea from encroaching on the works located to the north?

7.25 No evidence has been found, to date, to support the other functions, a beacon or limekiln, also theorised for the site.

7.26 A further question that the recent work has raised is that could the site have been used for a variety of functions? Although, only exposed for a short distance, foundations (**005/006)** and their relationship with the possible hearth is intriguing. Foundation (**006)** appears to have been inserted at a later date, possible to narrowing the area of the hearth (Plates 38 and 39). One reason to explain this modification could be to create a higher temperature within the hearth. Given that a temperature of 1100-1200c is required to smelt copper (Dungworth 2012), perhaps the initial design did not meet the required temperature or that it was subsequently used for a process requiring a higher temperature, such is required for smelting iron. Only further investigation/excavation and collection of *in situ* deposits may enable an understanding of the layout and use of the structure to be fully appreciated.

7.27 Finally, the date of the site and who was responsible for its construction are questions that remain unanswered. Whilst Moseley (2010) suggests construction of the copper smelter may be attributed to Robert Gibson, the 1784 Crown Lease granting rights to Jenkinson, Atkinson and Parkinson to mine and erect associated buildings on Commons or Waste Grounds is intriguing, especially as the Tithe Appointment indicates that the chimney was located on waste (see Appendix 2). Could this lease be why no documents

can be found relating to the site at Jenny Brown's Point as this lease gave the three men 'carte blanche' to undertake whatever works necessary to undertake their mining operations? Archive searches have, to date, been fruitless in finding any records relating to this site and despite extensive research undertaken on Messrs Jenkinson, Parkinson and Atkinson by Simon William's no direct links to the site have been found. Intriguingly, however, in a letter by William Hutchinson dated 1788, a link between Gibson and Jenkinson may have been found.

7.28 Hutchinson describes the tour of the site by Jenkinson but states that his 'curiosity of the remains had been greatly excited by the accounts given thereof in conversations with Robert Gibson Esq. who for some months in the summer makes Yelling the place of his residence, in account of the copper-works he is projecting there' (Hutchinson 1789, 211).

8 Proposals for Further Work

8.1 The work undertaken at Jenny Brown's Point outlined in this report has gone some way to address the lack of detailed recording/understanding of the archaeological remains at Sites 1 and 2. Further work, however, could be undertaken to enhance the archaeological record captured and investigate some of the questions, which have resulted from the investigations to date.

8.2 Landowner permission and SSSI consent may be required for some of the work proposed, given that the sites are located within or near Morecambe Bay SSSI and Ramsar site. Early liaison with Natural England is recommended to ensure that the distinct natural heritage of the area is considered and appropriate strategies are implement to protect the natural heritage alongside meeting archaeological objectives.

8.3 Proposals for potential further work are as follows:

General

- Obtain (where they exist) and analyse relevant sea/admiralty charts for the area
- Obtain (where they exist) Ordnance Survey Object Name Books

Site 1

- Undertaking a further aerial survey to capture the full extent of the embankment (Site 1A) and examine costal/erosion processes (SSSI and landowner consent required. Survey timing likely to have to be determined by bird winter roosting and spring nesting)
- Recording the remains of the quay/jetty (Site 1B) in detail using a method such as photogrammetry
- Investigating the relationship and possible phasing between the embankment (Site 1A) and quay/jetty (Site 1B) and - is the quay/jetty earlier, contemporary or later?
- Investigating and recording the brick and concrete remains at the north-eastern end of the jetty- are these associated with former 20th century military structures or something else?
- Comparing historic mapping/old photographs with the archaeological remains currently exposed at the site.
- Undertaking further documentary research to establish landownership, in particular in relation to the Summerhouse and land in this area recorded as owned by Paul Henry Fleetwood

Site 2

- Undertaking targeted archive research, focusing on Messrs Jenkinson, Parkinson and Atkinson as mentioned in the 1788 Crown Lease to determine if the chimney site is related to the mining activities on Common and Waste lands which the lease relates to

- Undertaking targeted excavation/test pits to:
    - establish the extent of the foundations comprising the structure at Site 1B
    - establish the nature of the hearth area and recover *in situ* archaeological artefacts/industrial residues to determine (where possible) the function of this part of the site;
    - recover (where possible) stratified artefacts to assist with the dating of the site
    - undertake scientific analysis on exposed hearth/burnt deposits (such as archaeomagnetic/thermoluminescence dating) to establish the date of last firing of the structure
- Undertaking further research into late 18th and early 19th century industrial sites, in an attempt to find comparable sites to that at Site 2.
- Investigating the deposit to the north of the chimney- does it represent a former storage area?

8.4 It is hoped that some of this work may be able to be completed as part of the Headlands to Headspace Scheme during 2017-8.

8.5 It is proposed that this work is taken forward during 2017-8. This additional work could include a rectified photographic record of the L-shaped quay (Site 1B) and recording of the concrete/brick strictures (Site 1C).

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Appendix 1: Scoping report for Jenny Brown's Point

Draft Scoping Report for Community Archaeological Investigations at Jenny Brown's Point, Silverdale, Lancashire

Introduction

This document outlines proposals for potential community archaeology investigations at Jenny Brown's Point, Silverdale, Lancashire.

It is designed as a tool for consultation with landowners, tenants, stakeholders, curators and the local community. The document has been produced by the Headlands to Headspaces (H2H) Cultural Heritage Officer for Morecambe Bay Partnership, in liaison with Peter Iles County Archaeologists for Lancashire and Simon Williams/Andy Denwood of Mourholme Local History Society.

The range of site investigation options presented below are to assist with initial consultations and should be seen as potential projects that can be used for investigating and recording the area, rather than actual H2H project proposals. The delivery of any of the site investigation options is dependent on gaining landowner/tenant consent, approval from the County Archaeologist from Lancashire County Council and budget/time constraints.

Location

Jenny Brown's Point is situated c. 1.5km to the south of the village of Silverdale and c. 14km to the north of the City of Lancaster (Fig. 1).

The immediate area of interest is shown in Fig. 2 and includes two discrete areas;

Site 1: Comprising the remains of stone embankment associated with the failed late 19th century land reclamation scheme (Plate 1), a substantial stone constructed L-shaped wall (forming a ?jetty/quay/landing platform; Plate 2) and concrete/brick/ metal remains that appear to be associated with a 20th century military features (Plate 3).

Plate 1. Stone embankment

Plate 2. Substantial L-shaped ?revetment wall

Plate 3: Concrete and brick features, possibly 20th military features

Site 2: Comprising a stone chimney (Plate 4) and ?associated stone foundations (Plates 5/6), together with a jetty which may form part of a late 18th century copper smelting site (Plate 7).

Plate 4. Chimney at Site 2

Plate 5. Walls observed to the east of the chimney

Plate 6. Wall foundations continuing into the salt marsh

Plate 7. Jetty situated to the south-west of the Chimney

The area of interest is bounded to the east and south and west by Warton Sands of Morecambe Bay. To the north is the promontory of Jack Scout (owned by the National Trust), farmland, a former quarry and Brown's Houses. The west of the area is bounded by salt marsh.

Archaeological Interest

Whilst local historians have researched the site and there have been a number of recent rapid archaeological surveys (ADD REFS), an accurate record of the physical remains at Jenny Brown's Point has never been acquired. Additionally, there remains a number of intriguing research based questions to be answered such as:

Site 1:

- What is the L-shaped wall (?Jetty/quay/revetment etc) and how does it relate to the embankment?
- How much of the embankment survives into the Bay and how often are new sections exposed/covered over by the sands?

- Do the brick/concrete/metal remains represent 20th century bombing range and if so, how do they relate to those in the wider area?

Site 2:

- What was the function of the chimney; beacon, lime kiln or copper smelting?
- What are the stonewall foundations eroding out of the salt march (Plate 6) and how do they relate to the chimney situated directly to the west?
- When was the chimney constructed and how may phases of use have their been?:
- If the site was used for copper smelting, where is the slag that would be expected from such a site? Is the small quantity of slag found near the site imported?
- How does the small Jetty situated to the south-west of the chimney relate to the chimney/possible copper smelting site?

Archaeological investigations that may be proposed for the site during the course of the H2H scheme would aim to:

- Gather data to produce an accurate baseline record of the archaeological remains surviving at Jenny Brown's Point;
- Establish (where possible) the form, function and date of archaeological remains exposed;
- Establish (where possible) phasing and how features relate to each other;
- Provide training opportunities in archaeological investigation/research/recording techniques;
- Record any evidence of erosion and/or new features bring exposed during the course of the project;
- Engage with and disseminate the results of the work to local community and visitors to the area (e.g. through site tours/open days, talks, leaflets)
- Produce illustrated reports detailing the results, a copy of which will be provided to the Lancashire County Council HER;
- Archive the primary data and results with the appropriate repositories (e.g. local museum/archives, Archaeological Data Service)

Potential for Community Archaeological Investigation

As demonstrated above, there are many unanswered questions surrounding the history of Jenny Brown's Point and the structures that have been left behind. This

area contains a rich heritage to explore, investigate, record and engage both the local community and visitors to Silverdale.

There are a number of community archaeology projects which could be undertaken at the site to address research questions and wider interpretation/community education which include:

- Site tours and open days (including engaging with local schools);
- Archive and secondary resource studies to produce a detailed Desk-based assessment;
- Survey of the remains to produce an accurate drawn and photographic record of both the jetty/embankment and other structural remains;
- Geophysical survey on the remaining salt marsh surrounding the chimney to identified below ground structures/archaeological remains;
- Excavation of the area to the west of the chimney;
- Production of identification and interpretation material (such as information boards/booklets/leaflets)

Each of these potential projects is outlined in more detail below.

Site Tours and Open Days

The Lancashire Coastal Way passes through Site 2 and to the north-west of Site 1. As a result the area is well used by walkers and who often question the function and date of the remains represent, in particular the very visible chimney (Simon Williams pers. comm..).

Whilst some information on the sites, in particular Site 2, can be found on the Internet, there is no dedicated interpretation either at the site or on the internet to inform and guide visitors.

Site tours and open days (such as Heritage Open Days and school visits) would provide opportunities for interested members of the public and the local community to visit the site, guided by heritage professionals. Such tours would be designed to place the physical remains surviving at the site in their historical context and be used as a vehicle to discuss community projects that can be undertaken to address many of the questions that surround the sites.
The open days would be designed to serve a wide audience and drawn in members of the local community and visitors to explore and investigate this important site.

Requirements

- Landowner/tenant farmer permission
- Risk assessments

- Tour guide/plan
- Advertisement

Potential timetable

Year 1:	September 2014: Heritage Open Day
Year 2:	Spring 2015: Open day/site tour to introduce the community project
	Summer 2015: Open day/site tour(s) during on site investigations (given permission is granted for this to proceed
	September 2015: Heritage Open Day-including results of project to date
Year 3:	Spring/Summer 2016: Open day/site tour(s) during on site investigations (given permission is granted for this to proceed)
Year 4:	Spring/Summer 2017: Open day/site tour(s) during on site investigations (given permission is granted for this to proceed)
Year 5:	Spring/Summer 2018: Open day/site tour(s) during on site investigations (given permission is granted for this to proceed)
	September 2018: Heritage Open Day
	Autumn 2018: Revealing interpretation/guides

Desk-based Assessment

A Desk-based Assessment would bring together all the known documentary and archaeological evidence into one document. This would include consultation of a variety of repositories and sources of information including:

Repositories to consult

- Archives and local studies libraries;
- The National Archives;
- English Heritage Archive;
- Historic Environment Record (HER) held by Lancashire County Council;
- PastScapes (online);
- Old Maps (online)
- Internet.

Sources of Information

- Historic mapping;
- Aerial photographs;
- Documents (e.g. deeds, agreements, conveyances, grants, wills);
- Photographs;
- Newspaper articles;

- Books and journal articles
- Archaeological surveys/studies.

The research would be primarily undertaken by volunteers, following training sessions at the various repositories. The information would be collated into an illustrated document that could be used to frame additional research questions. Research into copper smelting technologies and sites of comparable date would also be carried out to assist in the interpretation of the chimney at Site 2.

Requirements

- Training sessions at various repositories;
- Visits to archives/local studies/HER etc.;
- Access to mapping
- Volunteer network.

Potential timetable

Year 1:	Autumn/Winter 2014: Undertake training sessions and documentary research
Year 2:	Spring /Summer 2015: Collate information collected into Desk-based Assessment

Survey

The action of the tide and changing tidal patterns is both damaging and exposing archaeological features in this area on a regular basis. It is deemed as a priority to obtain an accurate record of the archaeological features at both sites. This would provide:

- an accurate record of what structures/features are currently exposed;
- a baseline record to allow for monitoring of erosion and/or exposure of additional features;
- a record to aid identification of the remains and identify areas where further survey/investigation may be required.

It is proposed that the survey work and recording would be achieved by both photographic and topographic recording of the sites, possibly using a variety of techniques described below.

Photography

On-site work

- Obtaining large scale aerial photographs of the site, in particular the embankment which can be used to map exposed archaeological features/erosion/the site during the course of the H2H project and the future;
- Taking rectified photographs of upstanding walls, to produce an accurate/scaled record;
- Collection of photogrammetric data to produce 3D models of the remains, which could be used for interpretation.

Desk-based work

- Analysis and comparison of aerial photographic records held by the English Heritage Archive (formally the NMR), Lancashire County Council and other repositories;
- Analysis of LIDAR data;
- Production of photographic archive;
- Production of a photogrammetry (3D) model.

Topographic survey

On site work

- Collection of survey data through a range of techniques including tape and offset and use of survey equipment such as TST (Total Station Theodolites) and GPS (Ground Positioning Systems);
- Production of scaled site plans;
- Production of hand-drawn elevations of upstanding walls/features;
- Collecting feature data on pro-forma recording forms.

10.

Desk-based work

- Production of accurate/scaled hachured plans of the sites, which can be used for reporting/interpretation;
- Production of inked elevations which can be used for reporting/interpretation;
- Production of a detailed archive report presenting the results.

Requirements

- Landowner/tenant farmer permission;
- Risk assessments;
- Specialist equipment provided by specialist contractor (medium-format

cameras for rectified photography, aerial cameras, GPS/TST equipment, survey data/manipulation programs);

- Training (provided by H2H CHO and specialist contractor) for community
11. groups in photographic and survey skills/data analysis/illustration/ reporting;
- Advertisement of training sessions/opportunities.

Potential timetable

Year 1:	Autumn 2014: Scope out project and gain permissions. Possibility of undertaking some initial field/desk-based survey work (in particular aerial record of site).
Year 2:	Spring /Summer 2015: Training sessions and initial on site photographic/topographic surveying
	Autumn/Winter 2015: Collation of site record and preliminary report
Year 3:	Spring/Summer 2016: Training session (assisted by Year 2 participants) and continuing on site photographic/topographic surveying
	Autumn/Winter 2016: Collation of site record and update preliminary report. Creation of photogrammetry model.
Year 4:	Spring/Summer 2017: Continuing on site photographic/topographic surveying, particularly to record any differences noted.
	Autumn/Winter 2017: Collation of site record and update preliminary report. Creation of photogrammetry model.
Year 5:	Spring/Summer 2018: Continuing on site photographic/topographic surveying, particularly to record any differences noted.
	Autumn 2018: production of final survey report and results of photogrammetry for interpretation.

Geophysical survey

There may be potential to undertake a small geophysical survey, in particular at Site 2, to the east of the chimney on the small section of salt marsh that remains in this area. Foundations of stone ?walls can be seen in this area which have eroded from but continue into the remaining salt marsh.

Geophysical survey is a non-intrusive technique that may assist in:

- identifying any archaeological remains (such as walls) buried beneath the surface;
- identifying the form/pattern/continuation of remains, which may assist with interpretation;

- identifying areas suitable for further investigation.

The use, application and results of geophysical survey methods on salt marsh/such a limited area requires further investigation before this method can be considered suitable for this site.

Excavation

There is potential to undertake excavation at the sites to expose buried archaeological features.

Excavation would only be undertaken after the survey of the site has been complete (perhaps in Years 2/3 of H2H) and areas for excavation have been thoroughly considered against research objectives, erosion concerns and health and safety considerations.

Initially, excavation would involve small trial investigations (e.g. 2m by 1m trench) to determine the level of preservation and where possible condition/date/form and function of any remains exposed. Following on from the trial investigations, a scheme of targeted excavation over a larger excavation may be proposed.

Excavation of the sites may assist in:

- establishing the form and function of the remains, in particular the L-shaped wall at Site 1 and the walls to the east of the chimney at Site 2;
- establishing the phasing/dating of the sites, through the investigation of relationships with other features and recovery of finds
- Answering questioned raised through the documentary research and survey work.

Requirements

- Landowner/tenant farmer permission;
- Production of detailed and costed project designs approval by the County Archaeologist for Lancashire;
- Strategies for reinstatement and/or spoil removal;
- Detailed risk assessments;

- Specialist equipment provided by contractor (fencing, shovels, trowels, recording equipment (for survey, drawing, written records and finds);
- Training (provided by H2H CHO and specialist contractor) for community groups in excavation, recording and reporting skills;
- Consideration of post-excavation analysis (including finds environmental processing, specialist analysis and reporting);
- Consideration of archive requirements;
- Advertisement of training sessions/opportunities.

Potential timetable

Year 1:	No excavation
Year 2:	Spring/Summer 2015: ?Possible on site small-scale trial excavation
	Autumn/Winter 2015: Collation of site record and production of results in preliminary report
Year 3:	Spring/Summer 2016: On site trial excavations
	Autumn/Winter 2016: Collation of site record and updated report. Present proposals for further work (if necessary).
Year 4:	Spring/Summer 2017: On site larger-scale excavations
	Autumn/Winter 2017: Collation of site record and post-excavation analysis.
Year 5:	Winter/Spring 2018: Production of final report and results for interpretation

Site Interpretation

As previously stated, whist the sites are situated on/close to the Lancashire Coastal Way there is no dedicated interpretation to assist the visitors in understanding and exploring the sites. One of the outcomes of a community archaeology project, could be to provide the visitor with this information, with particular reference to any new discoveries made during the course of the H2H scheme.

There are many ways to provide interpretation information of heritage sites. Each has their pros and cons and it would need careful consultation to establish what is the best way to provide interpretation/disseminate information to members of the public. The timetable for developing this resource would most likely be in Years 4-5 following the completion of site investigations and hopefully the discovery of new evidence which can enhance the history and stories of the site.

An overview of potential interpretation methods and possible pros and cons is shown below.

Interpretation Method	**Requirements**	**Pros**	**Cons**
On site interpretation panel	Permission from landowner Design of panel/ reconstruction? Production of panel- what	-Effective tool to engage all visitors/walkers -if production right, easily accessible to all sighted visitors -At site, don't have seek out information	-Weathers over time. -Information may become dated. -Who will take over long-term management following completion of H2H -Vandalism
Smartphone QR Codes and/or and NFC tags, web app	Design of information Consultation with specialist contractor to produce QR codes and/or NFC tags, web app Visitor to have access to smart phone	-QR Codes/Tags are discrete and cheap to encode -Can be easily/cheaply replaced if damaged -Information can be easily updated -small size of unobtrusive -visitor dictates their information seeking experience	-visitor needs to have access to smart phone/mobile network (weak at JBP) -may not engage with every visitor (not visible enough/visitor may not know how to use) -long-term management

Leaflets/pamphlets	Design and DTP Printing Storage and distribution of leaflets Use alongside other interpretation method to reach wide audience _can we link in the Coastal Way for longevity?	-accessible to a wide audience -information can be taken home/enjoyed after visit -can be distributed to many places/wide area (e.g. tourist info center's, train stations etc. May generate new visitor audience unaware of the site.	-Information may become dated over time -storage and distribution of leaflets (where/whom -inevitable

Communication of Projects

It is expected any projects undertaken at Jenny Brown's Point would be communicated to Stakeholders, Statutory bodies, the local community and wider public through a variety of methods including;

- Production of reports and written updates
- Blogs (online)
- Social media (Twitter/Facebook)
- Websites (e.g. Morecambe Bay Partnership/Council for British Archaeology, Heritage Lottery Fund);
- Talks and lectures (including local historical societies , MPB conference, national conferences);
- Press releases/newspaper articles;
- Journal articles;
- Site information boards/panels (outlining the project)
- School sessions (including discovery days/site visits).

By using a variety of methods of communication, it is intended that a wide audience will be engaged during the course of the project.

Appendix 2. Transcription of Crown Lease: Parkinson, Jenkinson, Atkinson: Mines in the manor and township of Warton with Lindeth alias Warton.

National Archives Reference: E 367/5980

Transcription by Kevin Grice (original copied by National Archives and stored at MBP offices)

CONTRACT FOR LEASE DECEMBER 17TH 1784

"COUNTY OF LANCASTER PARCEL OF THE POSSESSIONS OF THE CROWN OF

ENGLAND IN THE SAID COUNTY

ALL and all manner of Mines of Copper, Lead, Tin, Iron, Coal and other Mines and Minerals whatsoever found, gained, dug or opened or hereafter to be found, gained, dug or opened within, upon or under the Commons or Waste Grounds or other Lands belonging to the Crown within the Manor of Warton otherwise Warton with Lindeth or within the Township of Warton with Lindeth in the said County of Lancaster with full Power, Liberty and Authority to dig and open the Ground and Soil and to try and search for, get and take the said Mines and Minerals and to melt, smelt, convert, carry away, sell and dispose of and to erect such Mills, Warehouses, Smelting Houses and other Works and Buildings and to sink and make such Hydraughts and Watercourses in, through and over the said Lands or any part thereof as shall be found necessary, useful or expedient for the draining, working, winning, managing and maintaining the said Mines or any of them

EXCEPTING nevertheless and always Reserving all Royal Mines of Gold and Silver

AND ALSO EXCEPTING all such Mines as have been demised or granted by his Majesty or any of his Royal Predecessors for Terms of Years or other Estates as yet unexpired and not forfeited or surrendered if any such there be at this Annum

Examined by me G Augustus Selwyn Surveyor General Dec. 17, 1784"

[Marginal Note (to aid quick reference to the payment term):

"10s and 1/10th part in value of all Ores, Metals and Minerals to be gained from the premises"]

"**This Constat** is made forth and rated by virtue of Warrant from the Right Honourable the Lords Commissioners of his Majesty's Treasury bearing Date the twenty-ninth day of November last In order to the passing a Lease of the Premises therein mentioned with the Appurtenances (Except as therein is excepted) under the Exchequer Seal unto John Parkinson of Burton in Kendal in the County of Westmorland Surgeon, John Jenkinson of Yealand in the County of Lancaster School Master and Anthony Atkinson of Lancaster in the County of Lancaster Gentleman or unto whom they shall nominate and to his, her or their Executors, Administrators and Assigns

To hold for a term of Thirty-One years from the date thereof

Reserving to his Majesty, his heirs and successors a yearly rent of Ten Shillings payable to the Bayliffe or Receiver-General of the Premises for the time being or into the Exchequer at Michaelmas in every year during the said Term

And also reserving in like manner one full tenth part or Share in Value of all the Ores, Metals or Minerals whatsoever which shall be raised from or out of the said Premises or any part thereof to be accounted for in manner hereinafter mentioned according to the prices for which the same shall from time to time respectively be sold (being first well dressed, cleansed and made merchantable and fit for smelting) whether the same be raised by the Lessees, their Executors, Administrators or Assigns or by their Agents, Servants, Workmen or Under-tenants or by their or any of their Authority during the said Term, such part or share to be paid to such Person or Persons as shall be appointed to receive the same by the Lords Commissioners of the Treasury or the Lord High Treasurer for the time being at the time of weighing of the said Ores, Metals and Minerals respectively or for want of or in default of such Appointment, to the Bayliffe or Receiver-General of the Premises for the time being at Michaelmas in every year during the said Term

In which lease covenants are to be inserted for paying the said Rent and reserved Share of the said Ores, Metals and Minerals at the time and in the manner abovementioned, for weighing up all the said Ores, Metals and Minerals whatsoever (the same being first well dressed and washed and made merchantable and fit for smelting as aforesaid) once in every three Months at farthest after the digging and getting thereof, for giving or sending at least six days previous notice in writing to the Person or Persons who shall be appointed in that behalf of the several times of weighing respectively in order that he or they may attend to see the same weighed and that no Ore, Metal or Mineral whatsoever shall be sold, weighed or carried off the Premises without the presence or privity of such Agent or Agents

Also Covenants for obliging the Lessee to keep a regular and exact Account of the weight or quantity of all Ores, Metals and Minerals of whatsoever kind which shall be raised or gotten from the Premises and to whom and at what times and at what prices the same shall respectively be sold and to render such Account to the Auditor of the County of Lancaster at Michaelmas in every year or within sixty days after during the said Term upon the Oath of the Lessees, their Executors, Administrators or Assigns or some or one of them or the Steward or Agent who shall have the chief care and management of the said Mines and keeping the said Accounts and in default or failure of keeping or rendering such Accounts or of paying the Rents and Duties reserved to the Crown within the times permitted above for those purposes, the Lease shall be void and of no effect

And Power is to be set out for the Lords Commissioners of the Treasury or Lord High Treasurer for the time being to appoint any Officer, Surveyor or Agent whom they may think fit to inspect the said Accounts at any time, to examine all Books and Papers relating thereto and to take copies of the same or any part thereof

Ditto to view and survey the said Mines and Minerals at any time and in every and any stage and process of the Works and to do and perform any other matter and thing that he may have in charge for the more effectually bringing in of the said Share reserved to the Crown without fraud or delay

Covenants are also to be inserted for keeping the Mines and Works in good repair, for inclosing or otherwise effectually securing all Pits, Shafts or other Works belonging to the said Mines so that Man and Beast may be free from hurt, damage or injury from the same, for filling up and levelling all useless Pits and Shafts and all places where the Ground shall be ineffectually opened and for leaving all useful Pits and Works with sufficient Pillars or other Supports at proper and convenient distances in good repair at the end of the Term

Provisoes are also to be inserted that if the said Mines shall not be wrought and the Produce thereof duly accounted for and the Duty paid to the Crown within the space of three years from the date of the intended Lease or if the Lessees shall fail, desist or omit for the space of three calendar months or more together in any one year after the expiry of the said three years to keep one Pit or more with four able Miners at the least constantly and effectually at work in some part of the said Premises in an orderly and workmanlike manner unless prevented by Wars, Insurrections, Combinations of Miners, Storms, Tempests or other inevitable accident or shall not perform all the Covenants and Conditions before mentioned, the intended lease shall from thenceforth be void and determined

Ditto provisos for payment of the said Rent and reserved Share of the produce of the said Mines within sixty days after due, for inrolling the Lease and all Assignments that shall be made thereof with the Auditor of the Premises or his Deputy within six months from their respective dates and for entering Minutes or Docquets of the said Lease and Assignments in the Office of his Majesty's Surveyor General within a like span of six months from the Dates thereof AND in default made in either or any of the said Cases, the Lease and Assignments respectively to be void.

The Considerations of this Lease are to be the Rent, Reservations and Covenants therein to be reserved and committed to paper without Fine

Examined by me G Augustus Selwyn Surveyor General Dec. 17, 1784

Appendix 3. Excerpts from Warton in Lindeth Tithe Apportionment

Tithe Map Apportionment for Yealand Conyers, 1846 collated by Louise Parkinson from Lancashire Archives Ref No. PR 3332/11

JBP Area
Location of Brown's Houses (81): Owner – Matilda Jolly, Occupier – John Hall, House, barn and orchard
795: roads, rivers and waste ground
83: Owner – Richard Gillow, Occupier – Isaac Hall, barn and garden
84: Owner – Richard Gillow, Occupier – Isaac Hall, cottage and orchard
88: Owner – Richard Gillow, Occupier – Isaac Hall, allotment pasture
74: Owner and occupier - Paul Henry Fleetwood, garden and summer house

Quarry area
85: Owner – Richard Gillow, Occupier – Isaac Hall, croft - arable and pasture
86: Owner – Richard Gillow, Occupier – Isaac Hall, paddock – pasture
165: Owner – Matilda Jolly, Occupier – John Hall, High Barrow, pasture
166: Owner – Matilda Jolly, Occupier – John Hall, Low Barrow, arable and pasture
167: Owner – Richard Gillow, Occupier – Antony Hilton, allotment, pasture
A mining shaft is annotated where the chimney is today and a circular feature (presumably the chimney) is shown on this map. At the front of the apportionment is some sands that is known as 'Brown's', but no landowner name.

Warton Crag
292: Owner and occupier – Walter Strickland, plantation
293: Owner – John Jenkinson, Occupier – Richard Wadeson, King's Allotment, pasture
368: Owner – Thomas Christopher Burrow, Occupier – Richard Baines, Potts Allotment, pasture
367: Owner – Edmund Cloures, Occupier – William Barratt, allotment, pasture
309: Owner – Rev. William Mason, Occupier – William Whormby, Allotment, pasture
310: Owner and occupier – Richard Whormby, allotment, pasture

Appendix 4: Survey Station Information

Station Number	Station Type	Location	Grid Reference	Height	Detail
SITE 1- The embankment					
STN 1.1	Yellow heavy duty survey station	On area of salt marsh/grass at north-eastern end of embankment to south-west of seat and south-east of Jack Scout	346107.0223 473408.1540	N/A	
STN 1.2	Yellow heavy duty survey station	On height ground to east of seat to south of road	346156.4240 473420.2800	N/A	
Site 2- The chimney					
STN 2.1 (labelled at Point 25 on data provided by OAN)	Yellow heavy duty survey station	On raised section of saltmarsh to north-west of curvilinear revetment wall/jetty (Site 2C).	346650.3048 473528.2430	5.47	Main station used as TBM. Height calculated by Furness Mapping Services (labelled at STN 25 on FMSCAD data provided)
STN 2.2 (labelled at Point 5 on data provided by OAN)	Yellow heavy duty survey station	Within estuarine mud deposits to east of revetment wall/jetty (Site 2C)	34664.9648 473527.0030	4.07	Height calculated by Furness Mapping Services (labelled at STN 5 on FMS CAD

Station Number	Station Type	Location	Grid Reference	Height	Detail
					data provided)
STN 2.3 (labelled at Point 35 on data provided by OAN)	Yellow heavy duty survey station	On edge of saltmarsh c.52m to the north-east of the chimney	346679.2348 473546.1030	5.55	Height calculated by Furness Mapping Services (labelled at STN 35 on FMS CAD data provided)
STN 2.4 (labelled at Point 35 on data provided by OAN)	Yellow heavy duty survey station	On edge of saltmarsh c.135m to the north-east of the chimney (may be lost through erosion LM unable to find in Summer 2016)	346753.4848 473583.3630	5.40	Height calculated by Furness Mapping Services (labelled at STN 2 on FMS CAD data provided)

NOTE: Station co-ordinates have calculated from AutoCAD data files supplied by Oxford Archaeology North following the survey in 2015 and subsequent surveys undertaken by Furness Mapping Services in December 2015 and February 2016. Height data calculated by Furness Mapping Services.
The station names above are those allocated by Morecambe Bay Partnership.

See Figures 3 and 4 for survey station location

Appendix 5: CITiZAN report

Interim report for archaeological recording at Jenny Brown's Point Silverdale Lancashire

NGR: SD 47130 73816
OASIS reference: MOLAS1-247772
CITiZAN region: North

Report on a CITiZAN site survey

Sign-off History:

Issue No.	Date:	Prepared by:	Checked/ Approved by:	Reason for Issue:
1	06/04/16	Andy Sherman	Stephanie Ostrich/Project Officer	First draft
2				

Graphics: M Clement and A Sherman

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Summary

This report presents the results of a survey and training session carried out by CITiZAN, the Coastal and Intertidal Zone Archaeological Network, at Jenny Brown's Point in Silverdale, Lancashire. Jenny Brown's Point is suggested to be the site of a late 18th century copperworks, and a standing chimney on the site, designated as a Grade II Listed building (Listed Building number 181949), is thought to form part of the works. Jenny Brown's Point is also the location of an ambitious late 19th century land reclamation scheme which involved building a substantial seawall into Morecambe Bay, known as Walduck's Wall (PRN 11302). This project was abandoned by 1885 when the scheme ran out of money.

The site was first visited by CITiZAN on a tour of vulnerable coastal archaeology organised by Headlands to Headspace (H2H; the Morecambe Bay Partnership's cultural heritage project), to see whether there was potential for the projects to work in partnership to record heritage assets threatened by coastal erosion and tidal scour. This visit was conducted on the 27th April and it was subsequently agreed that H2H and CITiZAN would conduct a joint training workshop on the site in June. A short length of the leading edge of the salt marsh was recorded in section during the filming of CITiZAN's promotional video at Jenny Brown's Point on the 9th June 2015. A pair of one day training workshops where held at the site on the 19th and 20th June, during which volunteers recorded three stone-built features eroding out of the edge of the salt marsh. A total of nineteen members of the public were trained across the two days.

On the 19th June low tide was at 09:45 with a tidal height of 1.1m, high tide was at 15:10 with a tidal height of 8.8m. On the 20th June low tide was at 10:25 with a tidal height of 1.4m, high tide was at 15:50 with a tidal height of 8.5m.

Acknowledgements

The work of CITiZAN would not be possible without the support of our volunteers, sponsors and project partners.

CITiZAN North would like to thank the volunteers who have helped record the foreshore and the industrial landscape of Jenny Brown's Point. CITiZAN North are extremely grateful to Headlands to Headspace and their cultural heritage officer Louise Martin in particular, for the support, enthusiasm and advice they continue to offer.

CITiZAN North would also like to thank Ken Davies (Planning Officer (HER) Lancashire County Council), Peter Iles (Specialist Advisor (Archaeology) Lancashire County Council), Sue Stallibrass (Historic England Science Advisor, North West England) and Simon Williams for their help during the project and knowledge of the archaeology of Jenny Brown's Point.

CITiZAN is funded by a generous grant of £1.4 million from the Heritage Lottery Fund, with match funding from the Crown Estate and National Trust and additional support from Historic England. CITiZAN is hosted by MOLA (Museum of London Archaeology); our regional teams are based with MOLA in London and with our partners the Council for British Archaeology in York and Nautical Archaeology Society in Fort Cumberland, Portsmouth.

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1 Introduction

1.1 Site background

An archaeological survey on the enigmatic industrial remains at Jenny Brown's Point was conducted by CITiZAN and Headlands to Headspace (the Morecambe Bay Partnership's cultural heritage project) on the 19th and 20th June 2015. The industrial remains at Jenny Brown's Point are clustered around an extant Grade II Listed chimney (Listed Building number 181949) at NGR SD 46628 73522. While little is known about the history of the chimney or its use, it is currently thought to have formed part of a copperworks. The salt marsh at Jenny Brown's Point is actively eroding following a long period of accretion, revealing as it does so the remains of buildings and features likely associated with the chimney.

The following work is an interim report on the archaeological recording conducted by CITiZAN and Headlands to Headspace at Jenny Brown's Point. Headlands to Headspace are conducting an ongoing programme of community-based work recording the coastal erosion of the salt marsh, alongside an archaeological survey of the heritage assets located along the coastline at Jenny Brown's Point. A full report on the archaeological recording and coastal erosion will be compiled by Headlands to Headspace on the completion of their programme of works.

CITiZAN were initially taken on a tour of the foreshore archaeology at Jenny Brown's Point by Louise Martin (Cultural Heritage Officer for Headlands to Headspace) on the 27th April 2015 in the company of David Iles (Lancashire County Council's advisor (archaeology), Sue Stallibrass (Historic England Science Advisor, North West England) and Simon Williams (local historian).

A method statement was subsequently prepared by Headlands to Headspace taking into account health and safety issues, tidal windows, staffing and methodologies. A two day training workshop was conducted by CITiZAN and Headlands to Headspace on the 19th and 20th June 2015 recording features eroding from the salt marsh. A total of nineteen people were trained across the two days, twelve on the 19th June and seven of the 20th June.

On the 19th June low tide was at 09:45 with a tidal height of 1.1m, high tide was at 15:10 with a tidal height of 8.8m. On the 20th June low tide was at 10:25 with a tidal height of 1.4m, high tide was at 15:50 with a tidal height of 8.5m.

A Rapid Coastal Zone Assessment (RCZA) was prepared by Archaeological Research Services Ltd (ARS) for the North West of England; Jenny Brown's Point was surveyed by ARS for the Phase 2 assessment of the coastline (Eadie 2012). This document should be referred to for information on the natural geology, archaeological and historical background of the site (and the initial assessment of its archaeological potential). The remains of the copperworks at Jenny Brown's Point was highlighted during the first phase of the RCZA (Johnson 2011) and following site visits to the area was added to the fieldwork for the second phase of the RCZA (Eadie 2012) and surveyed accordingly.

The foreshore at Jenny Brown's Point is a Ramsar site, a Special Area of Conservation (SAC) and a Site of Special Scientific Interest (SSSI). Arnside and Silverdale are also registered as an Area of Outstanding Natural Beauty. The foreshore is owned by a local landowner, Mr Wilson and the surrounding marsh and mud flats are owned by the RSPB.

1.2 Research frameworks

The archaeological recording conducted by CITiZAN and Headlands to Headspace at Jenny Brown's Point falls under the research initiatives established in 2007 within the Archaeological Research Framework for North West England for Coastal and Marine Exploitation. In this instance initiative 7.16:

"Record the remains of maritime exploitation exposed in the intertidal zone. Use documentary and oral sources to provide an interpretative context" (Newman and McNeil 2007, 142).

CITiZAN's work at Jenny Brown's Point also falls within the regional research priorities established in English Heritage's review of progress in coastal heritage (Murphy 2014). The current work falls under the twelfth priority established for the Northwest:

"For the modern and industrial periods, survey is needed of … intertidal structures in Morecambe Bay" (Murphy 2014, 156).

Furthermore the survey was carried out within the terms of several of the CITiZAN themes and research priorities developed for the project:

- Coastal erosion
- Coastal industry

1.3 Aims and objectives

Prior to the fieldwork being conducted at Jenny Brown's Point a series of research questions were discussed between CITiZAN and Headlands to Headspace with three archaeological priorities being identified:

- Establish a permanent base-line at Jenny Brown's point from which future erosion monitoring could be conducted
- Establish the contemporary edge of the salt marsh
- Begin the recording of archaeological features eroding from the salt marsh

A two day training workshop was conducted on the 19th and 20th June 2015 with Headlands to Headspace. Headlands to Headspace are planning on conducting further archaeological recording at the site throughout 2016 and 2017.

1.4 Scope of the survey

A CITiZAN survey is not the same as full excavation. It is designed to locate and identify significant archaeological features currently exposed on the coast or foreshore and highlights those that are under threat from erosive forces. These surveys provide a baseline dataset so that their condition can be effectively monitored in the future.

1.5 Related outreach events

A public footpath runs to the rear of the salt marsh at Jenny Brown's Point and two members of the public were engaged with on the 9th of June during the filming of CITiZAN's promotional video. A further six members of the public were engaged with during the training workshop.

CITiZAN and Headlands to Headspace's work at Jenny Brown's Point was discussed as part of the North team's round up at the CITiZAN conference in Bridlington on the 10th October 2015.

2 Background research

A detailed description of the geology, archaeology and history of the site was provided in the earlier RCZA reports, especially Johnson 2009 and Eadie 2012. The following is a summary of the topographic, historical and archaeological data for foreshore at Jenny Brown's Point.

2.1 Topography

The bedrock geology of Jenny Brown's Point is formed by Carboniferous limestone from the Great Limestone group. Overlying the bedrock the superficial geology is formed by alluvial clay, silt sand and gravel (British Geological Survey). The intertidal zone at Silverdale is composed of extensive sand flats known as Warton Sands, with Warton marsh, a large area of salt marsh deposit forming the shoreline around the Listed chimney (181949/4821) (Farwell 2007).

The mean spring tidal range in the northeastern corner of Morecambe Bay is 8.40m and due to its orientation, it is more exposed to southwesterly storm waves then the southern section of the bay (Halcrow 2011).

2.2 Archaeology and documentary evidence

Prehistoric

Excavations at Storrs Moss (approximately 1 mile northeast of Jenny Brown's Point) by Liverpool University in the mid-1960s identified a small microlith scatter and several potential worked timbers. Radiocarbon dating of these timbers suggested that they dated to approximately 4200BC. Palaeo-botanical analysis indicated that the area was heavily wooded with species including alder and willow at the water's edge and oak and Scots pine at higher altitude (Denwood 2014; Powell, Oldfield and Corcoran 1971).

During the 1930s and 40s a farmer recovered a leaf-shaped arrowhead and four polished axe-heads dating to the Neolithic during ploughing at Yealand Storrs (approximately 2.5 miles northeast of Jenny Brown's Point). In 1941 the farmer also recovered a perforated, polished stone disk, 3 inches (7.62cm) in diameter. This artefact was examined by local archaeologist Oliver North who identified it as a Neolithic net sinker (Denwood 2014, 8-9).

Early medieval

Several early medieval hoards have been recovered from the Morecambe Bay area including those known as the Barrow-in-Furness Hoard (found in 2011 and dating to the late 10th century) and the Tewitfield Hoard (found in 1997 and dating to the early 10th century). A third known as the Silverdale Hoard was discovered a short distance from Jenny Brown's Point. This consisted of silver arm-rings, brooch fragments, ingots and coins all found (bar one coin) in, or underneath, a lead container. Among the artefacts in the hoard was an unknown coin type, one side of which read *DNS* (*Dominus*) *REX*, with the letters arranged in a cross-shape; on the other side, the inscription read *AIRDECONUT* which appeared to be the misspelling of the Scandinavian name Harthacnut, a ruler not previously known (White 1999; Richardson 2011).

Medieval

In the mid-13th century the Warton village charter prepared for Walter de Lindsay referred to a sea-dyke when describing areas of the manor to which the charter does not pertain. The boundary of one of the excluded areas is described as:

"The pasture of Southou, from Southou by the sea-dyke up to Quytsandpole and to Quitsandpole from the side up to Lindeth" (Booth 1976).

"This suggests medieval sea defences ran from Southou – possibly Cragfoot at the southwest end of the moss – across the mouth of the inlet to Quytsandpole, the modern Quicksand Pool – and to the shore of Lindeth: probably somewhere near where Jenny Brown's Point is today" (Denwood 2014, 21).

Post medieval

The 16th-18th century iron industry of the Lancaster to Kendal area was located because of the local availability of charcoal, but it did not have a local supply of iron ore. Most of the manufacturing sites were close to the coast and the documentary record indicates they were being supplied with ore from Furness via coastal shipping around Morecambe Bay (Newman 2003). Other heavy raw materials are likely to have been moved around the coast in a similar manner (McNeil and Newman 2006a, 148). The same is likely to be true for works at Jenny Brown's Point, possibly supplemented by local copper mining. Copper mining was conducted in the Silverdale area from the 16th century onwards around Coniston and to a less extent at Warton Crag and Heald Brow (Lancashire SMR: PRN 4821).

A copperworks is said to have been active on the site of Jenny Brown's Point between 1780 and 1820 (Bolton and Fogg 1978), although little documentary evidence has been found to confirm this. By the time of the first edition (1848) Ordnance Survey mapping the site is marked as 'ruins' (Lancashire SMR: PRN 4821). The only extant building on the site is a narrow, tapering chimney with a height of 10m, constructed from small, well-faced limestone blocks (UID 181949; PRN 4821). The function of the chimney is uncertain and theories on its purpose include use as a navigation marker and warning beacon, however the commonly accepted theory is that it forms part of the copperworks mentioned by Bolton and Fogg.

The foundations of several buildings or structures appear to survive intact below the salt marsh and reference is made to the transportation of copper ore and machinery to Jenny Brown's Point via the large stone quay associated with Walduck's Wall (PRN 11302, see below). However, some contention exists as to whether this refers to materials for Walduck's land reclamation scheme or for use at the copperworks (Lancashire SMR: PRN 4821; Bolton 1995).

In 1995 a small stone quay or jetty (PRN 520) was uncovered by coastal erosion, which is thought to be associated with the copperworks. This structure is aligned southeast-northwest and is constructed from large, roughly square cut limestone blocks. The structure stands to a surviving height of 1.2m and survives to a length of 17.5m (Eadie 2012, 156). There is evidence of a wooden jetty of early 19th century date (Ashmore 1969). A further short, stone jetty was exposed by erosion in 1997 at NGR SD 4659 7349. The jetty measured approximately 5m in length and was constructed from large blocks with a rubble core. A large baulk of timber was visible in the core on initial exposure. This jetty was consolidated by Lancashire County Council with a concrete slab (Lancashire HER PRNs 37067 and 4821).

In 1873 Henry Walduck proposed an ambitious scheme to construct a seawall across Morecambe Bay, in order to reclaim a substantial quantity of land. In May 1874 objections from local residents were heard in Parliamentary Committee that stated that foreshore grazing rights confirmed by the Enclosure Award of 1817 would be affected by the scheme. Walduck altered his plans to avoid these complications, with his modified reclamation scheme now enclosing land between Jenny Brown's Point and Hest Bank (Lancashire SMR: PRN 11302). The reclamation scheme consisted of a large limestone seawall (PRN 4821) constructed from material extracted from a quarry (PRN 12271) at Jenny Brown's Point. Running along the top of the seawall from the quarry face was a narrow gauge rail line (*pers comm* Simon Williams). By 1885 the works were abandoned due to a lack of funds (Eadie 2012, 158) with less than half the seawall constructed.

Located between the potential copperworks chimney and Walduck's Wall at NGR SD 46499 73484 are two Grade II Listed buildings known as Brown's Houses 1 and 2 (UID 181950). These houses were built in the mid-18th century and used as accommodation for the workers building Walduck's Wall (*pers comm* Simon Williams).

Modern

During the Second World War the salt marsh on the eastern side of Quicksand Pool was used as a bombing practice range and several targeting markers are extant across the area (*pers comm* Louise Martin). The foundations of a destroyed Second World War pillbox can be seen just to the north of the quay associated with Walduck's Wall (*pers comm* Louise Martin).

A steel and concrete bridge located at NGR SD 46589 73496 allowed access to salt march on the eastern side of Quicksand Pool for grazing. The bridge was approached by a raised causeway formed of demolition material. The structure was in use during the late 20th century but abandoned by 2000 and by 2003 the structure had collapsed (Lancashire HER PRN 37067).

3 Survey methodology

3.1 Training methodology

The industrial landscape revealed by the erosion of the salt marsh was recorded as part of a one day training workshop run in association with Headlands to Headspace.

A full CITiZAN training session consists of a half-day classroom session that includes briefings on site background and archaeological methodology alongside foreshore health and safety in conjunction with a day's fieldwork. One-day training workshops consist of a shorter classroom session concentrating of a narrower field of interest, followed by a half-day of on-site practical work.

On completion of a full training session volunteers qualify for a CITiZAN Archaeology Skills Passport in which to record learnt skills.

All volunteers must adhere to Health and Safety assessments (CITiZAN 2015c) and the CITiZAN code of conduct (CITiZAN 2015a).

3.2 Recovery and ownership of finds

CITiZAN is focused on recording and monitoring structures, landscapes and archaeological features and will not systematically collect finds. However in certain circumstances finds of specific and unique intrinsic interest may be recovered. These finds will in general fall under the terms of the Treasure Act 1996.

In the event of 'Treasure' being recovered during a CITiZAN training or outreach event the artefacts in question will be reported to the local coroner and surrendered to the regional Portable Antiquities Scheme Finds Liaison Officer.

3.3 Field methodology

The training workshop was carried out in accordance with a Method Statement prepared by Headlands to Headspace (Headlands to Headspace 2015).

Intrusive archaeological methods will not be used during CITiZAN training and outreach events, with the exception of surface cleaning to reveal obscured archaeological detail (to a maximum depth of 80mm). Wooden features will not be cleaned with metal tools, were necessary they will be cleaned with soft brushes, sponges or the direct application of low pressure water as appropriate.

Targeted environmental sampling will occasional be conducted during CITiZAN training and outreach events. Where environmental sampling is to be used a detailed methodology will be included in.

Areas/features were cleaned by hand and surveyed by the CITiZAN volunteer team, supervised by a member of CITiZAN staff.

All features were located using a hand help Garmin eTrex 10 with an accuracy of plus or minus 3m.

3.4 Recording methodology

A written and drawn record of appropriate features was carried out using CITiZAN proformas and the CITiZAN app. Hand written notes were taken in the field to record the findings of on-site analysis of features during monitoring visits, workshops and training seasons as necessary. These were notes on

the fabric, form, function and evidence of past changes to features. All hand written notes will be included in the material to be archived.

All appropriate features were photographed using suitable high end digital, medium and large format cameras. The photographic record illustrates all significant phases, structures, important stratigraphic and structural relationships, and individual items of interest. All site photographs, except 'working shots', will include a photographic scale of appropriate size.

All photographs are taken using digital cameras; MOLA does not use colour or black and white film.

Appropriate features were planned at a scale of 1:20 or 1:10 as applicable, sections were drawn at a scale of 1:10 were necessary.

The drawn site records, the completed CAD drawings presented in the report and the use of existing survey drawings will conform to the conventions and procedures laid out in Museum of London Archaeology's *Archaeological Site Manual* (MOLAS 1994).

Other digital illustration programs, beside CAD, may be used were appropriate in the production of report drawings. All drawings used to illustrate the report will conform to the conventions and procedures laid out in Museum of London Archaeology's *Archaeological Site Manual* (MOLAS 1994).

Where appropriate, features will be recorded using the CITiZAN app. Sites recorded using the app will be moderated by CITiZAN staff and uploaded to CITiZAN's webhosted interactive map.

4 Results

Due to the CITiZAN projects non-intrusive methods no sections were straightened or cut-back, as a result several of the measurements below are only approximate.

For area and feature locations see Figs 1 and 2. For feature plans see Figs 3-6. No finds were recovered during the current works.

4.1 Area 1: Stone structures

Eroding out of the south facing edge of the salt marsh are two probable stone-built features (100 and 101) (see Fig 2; 3 and 4).

The lower stone feature (101) has an exposed length of 1.00m and an exposed width of 0.20m; the feature appeared to be aligned northeast-southwest. Stone feature 101 was formed from roughly faced sub-rectangular limestone blocks varying in size between 0.58m by 0.38m and 0.22m by 0.40m. Feature 101 appeared to consist of a single course of stonework; a single sub-rectangular stone possibly formed the remains of a second course of construction at the features southwestern end. However, it was uncertain whether this stone block was *in situ*.

Partially overlying the northeastern end of feature 101 was a second stone-built feature (100). Feature 100 had an exposed length of 1.75m and an exposed width of 1.32m. The structure was built from large, squared, well-faced limestone blocks the largest of which measured 0.68m by 0.64m in size. Feature 100 was constructed of three courses and appeared to have two distinct faces, one orientated north northwest-south southeast, the other orientated northeast-southwest. Neither structure 100 or 101 appeared to be bonded; however it is entirely possible that the bonding material has been washed out by coastal erosion.

Overlying both features was the deposit of 'turf and topsoil' (201) that formed the salt marsh.

A short distance to the north of features 100 and 101 a small section of walling (102) had been exposed in an erosion scar located towards the centre of the salt marsh. Only a small area of this structure was revealed; the total exposed length of the structure was 1.30m and the total exposed width was 0.74m. Feature 102 was constructed from sub-rectangular limestone blocks with a maximum size of 0.73m by 0.30m and sub-rounded cobbles that measured up to 0.226m by 0.32m. The feature was bonded with light grey coloured lime mortar that contained occasional small fragments of coal.

4.2 Area 2: Industrial landsurface

A post medieval landsurface was identified eroding out of the edge of salt march approximately 6m east of the chimney (181949/4821) at NGR SD 46650 73524 (see Figs 2; 6 and 7). This section was identified on CITiZAN's initial visit to the Jenny Brown's Point on 27th April and was recorded on 9th June 2015.

The basal deposit exposed in the edge of the salt marsh was a limestone bedrock (203) with an exposed depth of 0.19m. Overlying the bedrock was a blackish brown silty clay (202) that contained occasional quantities of sub-angular, heat effected stone that varied in length between 40mm and 90mm with a maximum depth of 70mm. Context 202 also contained occasional small lumps of coal up to 20mm in length and isolated, small fragments of probable copper slag. The context had an approximate depth of 0.11m. Overlying the silty clay 202 was a deposit of turf and topsoil (201) formed by a dark brown silty sandy clay. Context 201 contained isolated small sub-rounded and sub-

angular stones up to 20mm in length and isolated flecks of coal. The deposit had an approximate depth of 0.26m.

4.3 Area 3: The edge of the salt marsh

The contemporary edge of the salt marsh was recorded by off-set survey for a short distance along the edge of the foreshore (see Fig 3). This shoreline is rapidly eroding (see Fig 9) and Headlands to Headspace are conducting a long term programme of monitoring to record this erosion.

A drone survey was conducted of the foreshore at Jenny Brown's Point on 19th June by Oxford Archaeology North in order to produce a model of the wider industrial landscape and a contour survey of the foreshore. The results of this work will be published in the full report produced by Headlands to Headspace on the completion of their recording and monitoring programme.

4.4 Training results

Comprehensive evaluation of all CITiZAN training and outreach events is being conducted by an external evaluator as a condition of the project's Heritage Lottery Grant. A copy of the relevant report outlining the results of these evaluations can be supplied on request.

In summary the CITiZAN training session at Jenny Brown's Point included instruction and practice in the following archaeological skills:

- Health and safety on the foreshore
- Identification of foreshore archaeological features
- Scale drawing
- Archaeological photography
- Use of handheld GPS units

A total of nineteen people attended the CITiZAN and Headlands to Headspace's training session at Jenny Brown's Point; twelve on 19th June and seven on 20 June.

5 Conclusions and recommendations

5.1 General discussion of the survey

A total of three stone-built features (100 – 102) were identified during the fieldwork at Jenny Brown's Point. Due to the non-intrusive nature of the project it was only possible to inspect the areas of each feature which had been exposed by erosion, making it extremely difficult to draw any definitive conclusions about their function. The presence of a thin but extensive deposit of silty clay contaminated with heat effected stones, coal fragments and copper slag across the site might indicate that these features are associated with the extant chimney and presumed associated copperworks.

The apparent lack of survival of bonding material in features 100 and 101 makes establishing a chronology for the site difficult. However, the apparent stratigraphic relationship between features 100 and 101 (feature 100 appeared to overlie feature 101) and the apparent differences in the construction material (feature 100 was constructed from larger, better prepared limestone blocks than features 101 and 102), could suggest that at least two phases of construction are present on the site.

What is apparent from the fieldwork is that an extensive landscape survives below the level of the salt marsh and that further investigation of this would be worthwhile. It seems likely that a more intrusive methodology, perhaps exploring areas of the salt marsh already eroding, could produce answers as to the function and age of the site.

5.2 Answering original research aims

Prior to the start of fieldwork three research aims were proposed:

- Establish a permanent base-line at Jenny Brown's point from which future erosion monitoring could be conducted
- Establish the contemporary edge of the salt marsh
- Begin the recording of archaeological features eroding from the salt marsh

The current fieldwork has successfully completed these aims. A permanent base line was established with the assistance of Oxford Archaeology North, who also produced an accurate model of the foreshore and salt marsh surrounding the site. A section of the edge of the salt marsh was also recorded by CITiZAN volunteers using an off-set survey from a baseline.

Across the two days of the training workshop volunteers archaeologically recorded the remains of three stone-built features that had been exposed by tidal erosion. The training workshop also established a group of volunteers with an understanding of archaeological recording techniques who can be co-ordinated by Headlands to Headspace in further recording of tidal erosion at the site.

5.3 New research aims

In addition to the continuing erosion monitoring being conducted by Headlands to Headspace and the archaeological recording of the ensuing exposed features, it is suggested that a scheme of discreet archaeological excavations is conducted in order to further examine the date and function of the archaeological features identified during the current work.

6 Dissemination

The results of the survey will be made publicly available on the CITiZAN website: http://www.citizan.org.uk/. The feature data will be uploaded to the CITiZAN interactive database, to allow ease of future long-term monitoring of the site via the CITiZAN online interactive map and smart phone app and to permit inclusion of the data in any future academic researches into coastal and intertidal archaeology. This can be found at http://www.citizan.org.uk/interactive-coastal-map/.

Records created by this survey will be deposited with the Archaeology Data Service (ADS) where it will make up a part of the archive of all data and materials created by CITiZAN. It will be deposited with appropriate local repositories via the ADS.

A short note on the results of the survey will be submitted to the appropriate journals to be included in annual county and period fieldwork round-ups.

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Fig 1: Site location.

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Fig 2: Locations of areas of interest.

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Fig 3: Survey of salt marsh edge.

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Fig 4: Plan of feature (100)

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Fig 5: Plan of feature (101)

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Fig 6: Southwest facing sketch section of salt marsh edge.

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Figure 7: Walduck's Wall (PRN 11302). View to the southwest.

Figure 8: The foreshore at Jenny Brown's Point, showing the collapsed bridge (foreground), the small stone quay (PRN 520; middle ground) and chimney (UID 181949/PRN 4821; background). View to the northeast.

Figure 9: Erosion of the salt marsh edge. View to the north.

Figure 10: Recording the edge of the salt marsh.

Figure 11: Headlands to Headspace's Cultural Heritage Officer teaching archaeological surveying to volunteers. View to the east.

Figure 12: Volunteers planning the edge of the salt marsh. View to the west.

Figure 13: Preparing for the drone survey of the foreshore. View to the southwest.

Figure 14: Filming at the base of the chimney. View to the east.

8 Appendix 1: Context index

Context	Description	Approximate depth below current ground surface
100	Stone feature eroding out for the salt marsh edge	N/A
101	Stone feature eroding out for the salt marsh edge	N/A
102	Stone feature eroding from erosion scar in centre of salt marsh	N/A
201	Turf and top (Dark brown silty sandy clay)	0 – 0.26m
202	Blackish brown silty clay	0.26m – 0.37m
203	Limestone bedrock	0.37m – 0.56m

Table 1: Index of context numbers

9 OASIS form

OASIS ID: molas1-247772

Project details	
Project name	Interim report for the archaeological recoding at Jenny Brown's Point
Short description of the project	A total of three stone structures were identified eroding out of the salt marsh edge at Jenny Brown's Point. These structures are thought to be associated with the potential late 18th century copper works on the site. A joint training season was held by Headlands to Headspace and CITiZAN to provide volunteers with the skills to record these features.
Project dates	Start: 09-06-2015 End: 20-06-2015
Previous/future work	Not known / Yes
Type of project	Research project
Site status	Site of Special Scientific Importance (SSSI)
Current Land use	Coastland 3 - Above high water
Monument type	STRUCTURE Post medieval
Significant Finds	NONE None
Investigation type	''Field observation'', ''Part Survey''
Prompt	Research
Project location	
Country	England
Site location	LANCASHIRE LANCASTER SILVERDALE Jenny Brown's Point
Study area	50 Square metres
Site coordinates	SD 47130 78316 54.197702947117 -2.810497106166 54 11 51 N 002 48 37 W Point
Project creators	

Name of Organisation	CITiZAN
Project brief originator	CITiZAN
Project design originator	Headlands to Headspace
Project director/manager	Louise Martin
Project director/manager	Stephanie Ostrich
Project supervisor	Andy Sherman
Project supervisor	Megan Clement
Type of sponsor/funding body	Heritage Lottery Funding
Name of sponsor/funding body	Heritage Lottery Fund
Project archives	
Physical Archive Exists?	No
Digital Archive recipient	ADS
Digital Media available	''Images raster / digital photography'', ''Spreadsheets'', ''Text''
Paper Archive recipient	To be designated
Paper Media available	''Plan'', ''Section'', ''Notebook - Excavation', 'Research', 'General Notes''
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)

Title	Interim report for archaeological recording at Jenny Brown's Point, Report on a CITiZAN site survey
Author(s)/Editor(s)	Sherman A
Date	2016
Issuer or publisher	MOLA
Place of issue or publication	York
Entered by	andy sherman (asherman@mola.org.uk)
Entered on	7 April 2016

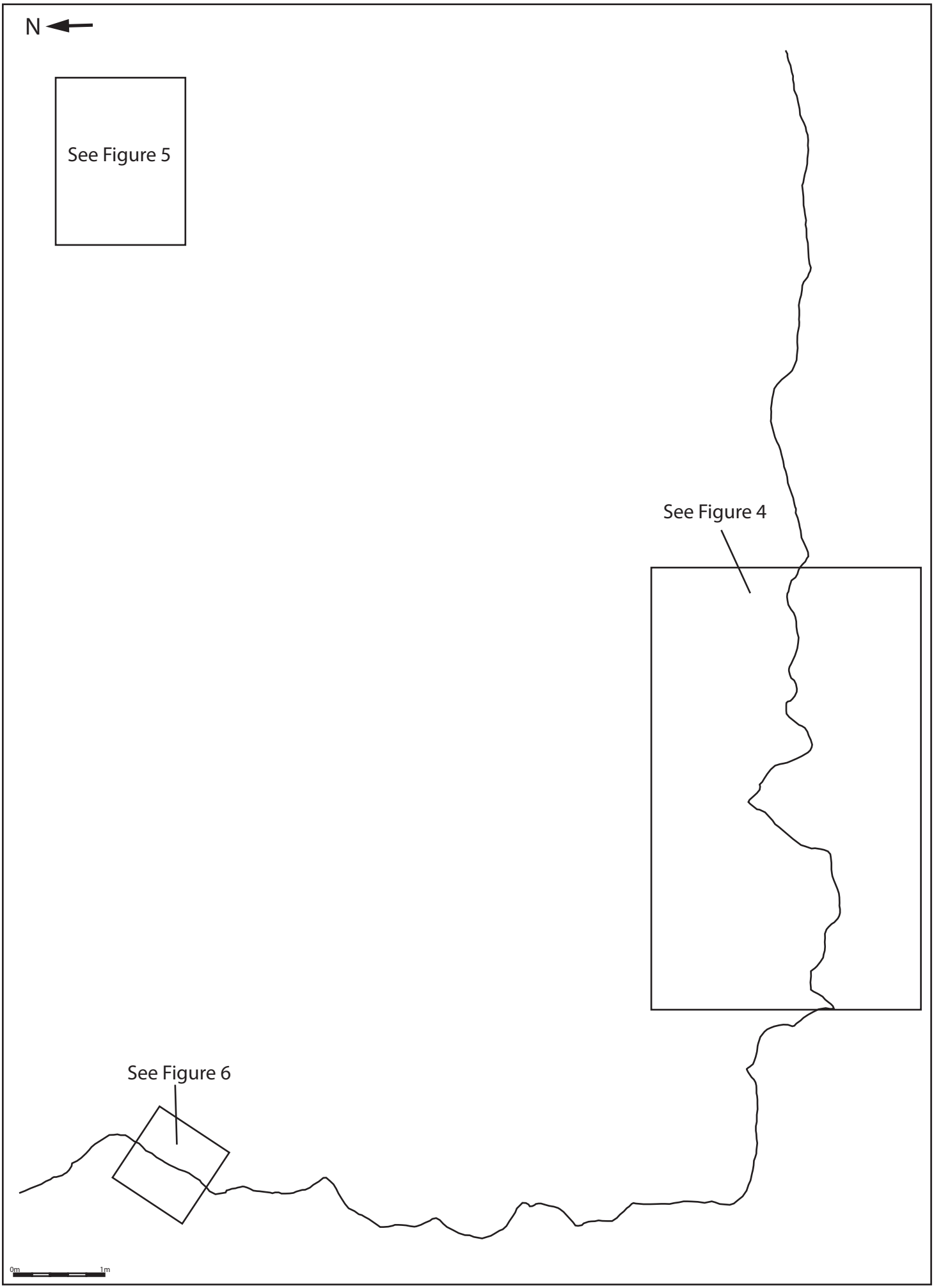

Fig 2: Locations of areas of interest

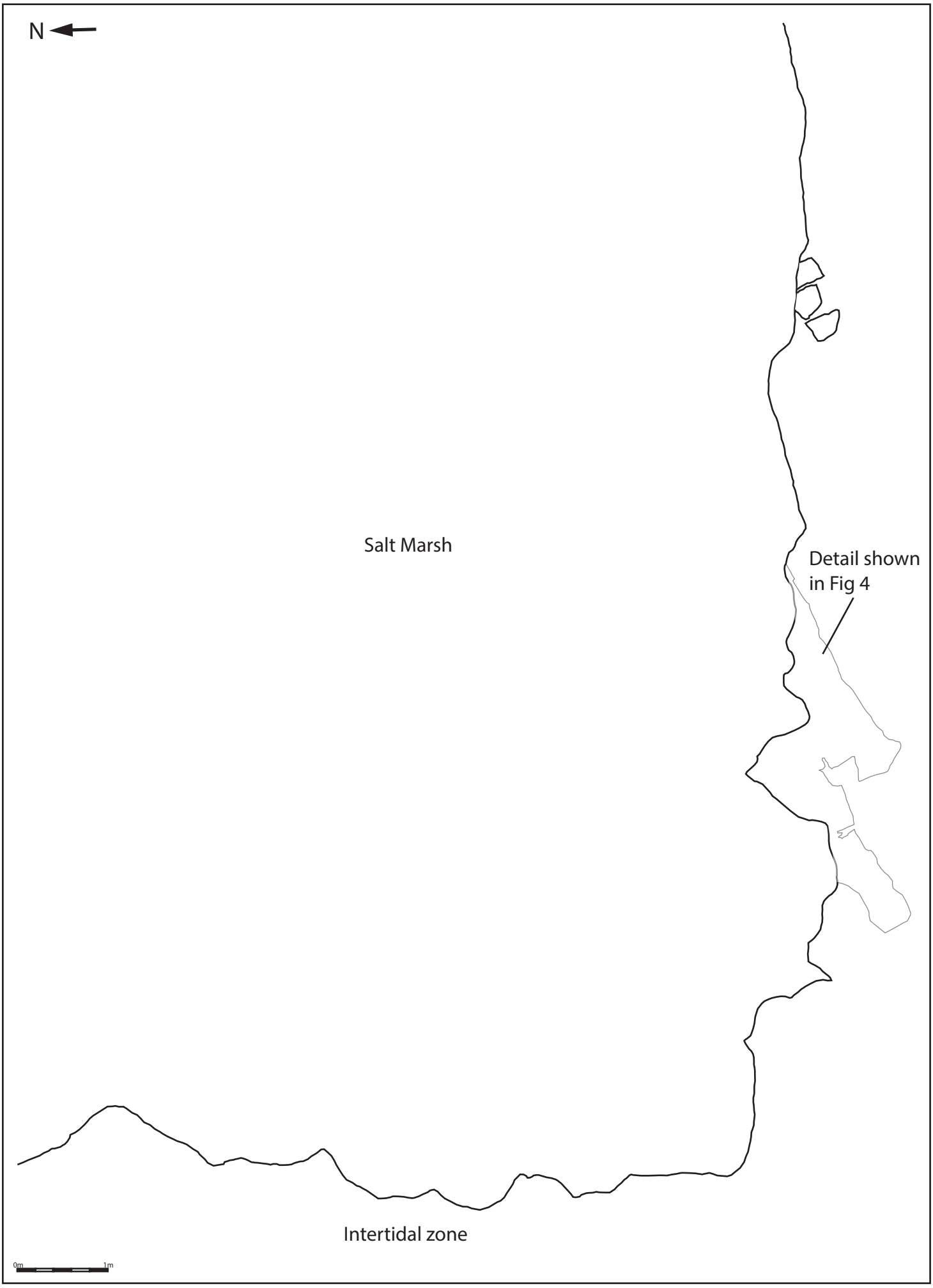

Fig 3: Survey of salt marsh edge.

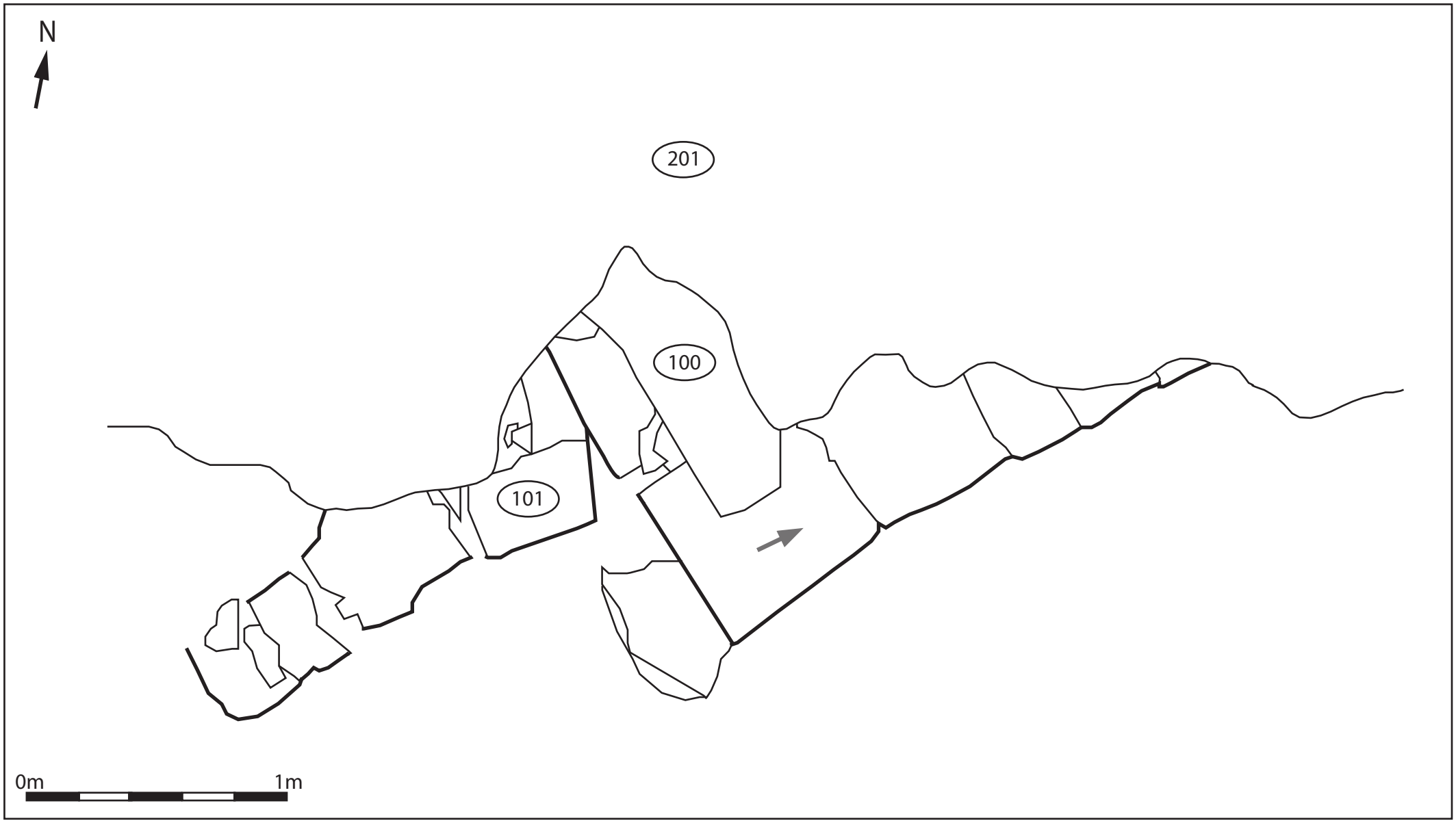

Fig 4: Plan of feature (100)

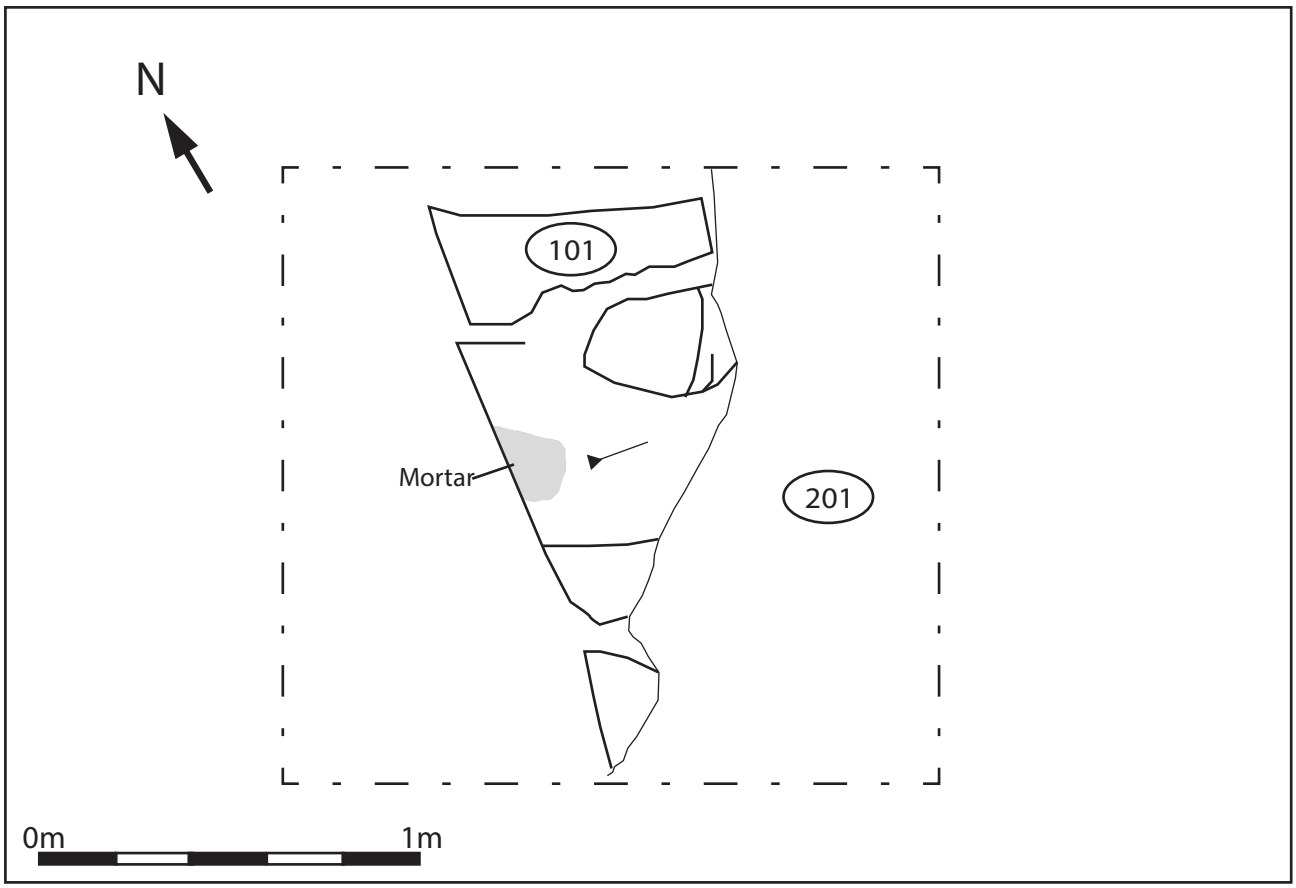

Fig 5: Plan of feature (101)

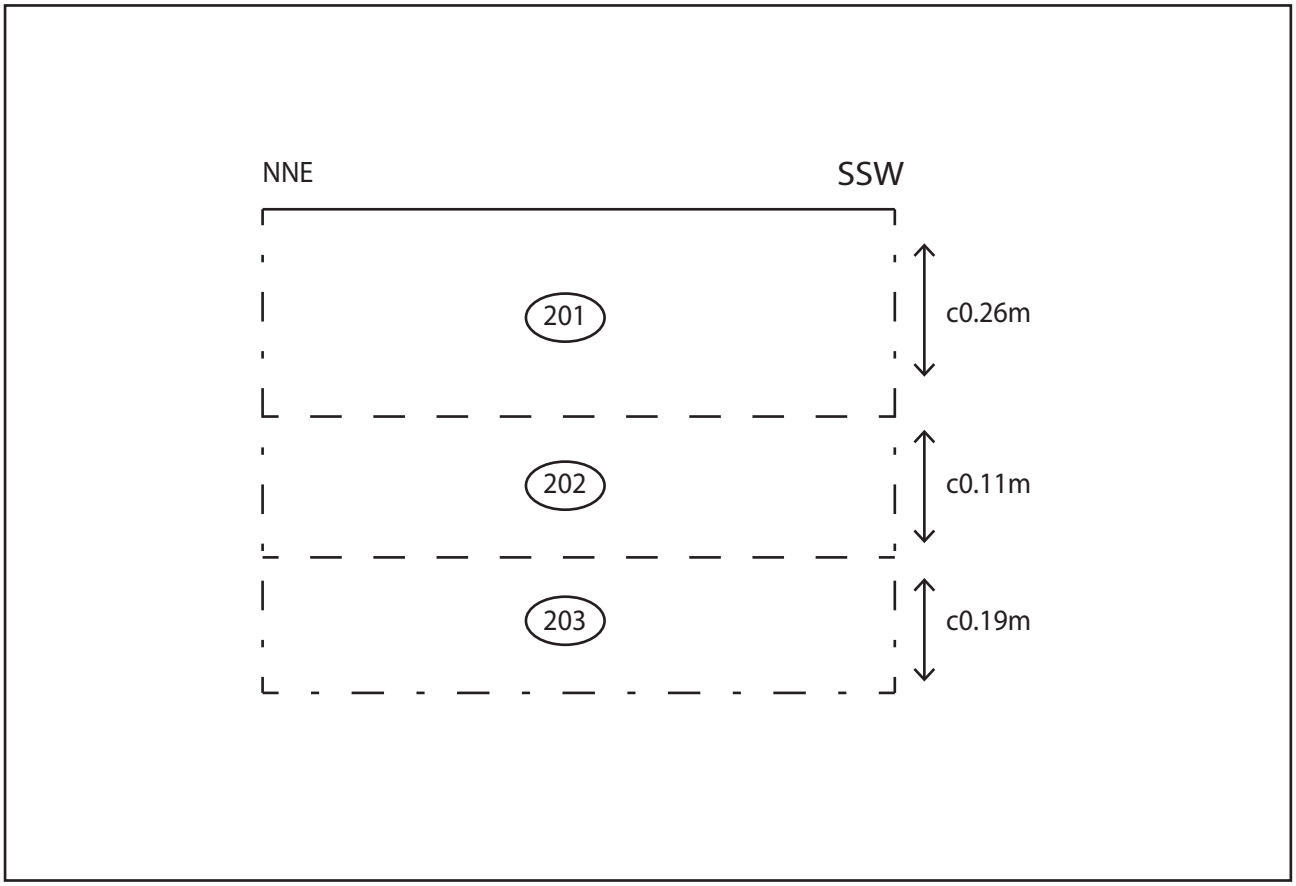

Fig 6: Southwest facing sketch section of salt marsh edge

Appendix 6: List of loose/unstratified finds recovered from the vicinity of Site 2

Site Code	Context	ID	Small Find No	Area	Material 1	Material 2	Identification	Quantity	Notes	Specialist 1
JBP 15	U/S	1/15	3	Near Hearth deposit 027	Copper		Rivet	1	Found near hearth associated with building to east of chimney- ships rivet? May have been washed in my tide	
JBP 15	U/S	2/15	3	Near Hearth deposit 027	Metallic Ore	?Droplet		1	Found near hearth, unstratified (XFR Report No. JBP 4.2- Copper ore with high levels of calcium and iron and 4.4 Possible droplet with copper, zinc and high lead content)	Gerry Mc D 13/07/16
JBP 15	U/S	3/15	1	On surface of 010	Copper	Ore		1	(XRF Report No JBP 2 – Copper Ore)	Gerry Mc D 13/07/16
JBP 15	U/S	4/15		N/A	Iron		Object	1	Conglomerate- iron bar, donated to LM by B Holmes- resident of Brown's Houses August 2015 who had ID'ed as slag and had collected from near the chimney	
JBP/15	U/S	5/15		On surface of 010 near chimney 026	Iron	Ore		1	Surface found find near chimney (XFR Report No. JBP 6 Dominated by iron and streak test revealed it to be a piece of ore)	Gerry Mc D 13/07/16
JBP 15	U/S	6/15		On surface	Iron		Slag/Objects	13	Slags and possible iron objects	Gerry Mc D

Site Code	Context	ID	Small Find No	Area	Material 1	Material 2	Identification	Quantity	Notes	Specialist 1
				of 010 near chimney 026					found near the chimney- surface finds (XFR Report No.7.1-7.8- Three types of material present within this bag of finds. Four were iron metal (7.1, 7.2, 7.5 and 7.8) with adhering slag or clinker, which could suggest they are part of a furnace/hearth structure. One fragment of iron ore (7.4) different to JBP 6 and three samples of iron slag (JBP7.3, 7.6 and 7.7) with traces of copper.	13/07/16
JBP 15	U/S	7/15		On surface of 010 near chimney 026	Iron		Nail	1	Found near the chimney- surface find	
JBP 15	U/S	8/15		On surface of 010 near chimney 026	Pot		Pottery wall sherd- post-medieval	1	Found near chimney with ID 6/15	
JBP 15	U/S	9/15		On surface 010	Iron		Nail	1	Surface find	
JBP 15	U/S	10/15		On surface near 001A/B	Copper	Ore		1	Surface find near building foundations 001 A/B (XFR Report No. JBP 3- copper	Gerry Mc D 13/07/16

Site Code	Context	ID	Small Find No	Area	Material 1	Material 2	Identification	Quantity	Notes	Specialist 1
									ore)	
JBP 15	U/S	11/15	6	On surface 010	Copper/Lead?		Object	1	Object with lettering (lift the dot?) button- surface find	
JBP 15	U/S	12/15		On surface 010	Copper	Ore		3	Surface find (XFR Report No. JBP 1.1- copper ore with very low iron content/no lead)	Gerry Mc D 13/07/16
JBP 15	U/S	13/15		On surface 010	Iron		Object	1	Conglomerate possible iron object	
JBP 15	U/S	15/15		On surface 010- near 014	Iron		Object	1	Attached to stone- similar to others in situ forming revetment wall 014	
JBP 15	012	16/15			Iron		Object/Slag	1	Recovered from a disturbed area north-east of Site 2B towards the field boundary	
JBP 15	U/S	17/15	4	On surface 010 near 004	Iron		Chain link?	1	Recovered from surface of rubble layer 010 near 004	
JBP 15	U/S	18/15		On surface 010	Coal		Fragments	6	Surface find on 010	
JBP 15	U/S	19/15		Near 027	Ceramic		Brick	1	Fire brick- recovered near hearth 027- similar bricks in hearth	
JBP 15	U/S	20/15		On surface 010 to south of 026	Ceramic		Brick	2	Fire bricks recovered loose 4m south of chimney 026 in 010	
JBP 15	U/S	21/15		Recovered loose from 027	Ceramic	Iron Slag	Brick	1	Fire brick with slag adhered recovered loose from 027	Gerry Mc D 13/07/16- Sample only

Site Code	Context	ID	Small Find No	Area	Material 1	Material 2	Identification	Quantity	Notes	Specialist 1
									(XRF Report No. JBP 8. Furnace/Firebrick	
JBP 16	U/S	1/16		Recovered loose from 027	Iron	Clinker		1	Loose from near hearth 027 (XFR Report No. JBP5- fragment of iron clinker similar to slag generated in a steam engine, dominated by iron, lime and silica with only traces of copper, with elevated levels of strontium)	Gerry Mc D 13/07/16
JBP 16	U/S	2/16		Recovered loose from 027	Coal	Cinder		4	U/S near hearth 027	
JBP 16	U/S	3/16		Recovered loose from surface of 010	Pottery	Post-medieval		1	U/S near chimney 026	
JBP16	U/S	4/16		Recovered loose from near 027	Iron?	Slag		1	U/S near hearth 027	
JBP16	U/S	5/16		Loose from 011	Iron	Object		1	Found on beach/mud (011) to east of 005	
JBP 16	U/S	6/16		Recovered loose from surface of 010	Iron?	Slag		1	Surface find on 010	

Appendix 7: List of contexts recorded at Sites 2A to D

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
001 A and B	North-east to south west aligned wall comprising limestone blocks, which extend from 020 and run into the saltmarsh as 001B Possibly continue as 006.	002 and possibly 005/006	001A c.2.8m by 1.0m by 0.19m in height exposed 001B c.2.4m by 1.4m by 0.19m in height exposed	Possible wall of ? flue/building May continue to the north-east as 005	ND, AP	001A=101 001B=100
002	North-east to south west aligned wall comprising limestone blocks. One course (up to four blocks in width) exposed. The limestone blocks are mortared. Size of material forming the foundation measured L. 0.32-0.92m, W. 0.25-0.39m, H/D. 0.16-0.25m	001 and 005?	L. 3.48m exposed W. 1.13m H/D. 0.30m	Possible wall of ? flue/building.	ND, AP	
003	Possible wall/foundation	002	L. 4.23 exposed	Part of 002	ND, AP	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	which abuts 002? May just be part of 002. One course (two blocks wide) of limestone blocks which measure L. 1.15-0.32m, W. 0.18-0.66m, H/D. 0.11-0.18m		W. 1.53m H/D. 0.16m			
004	One course of cruder worked stone different to 003 put may be part of same structure. In filled with loose rubble 010 . Limestone blocks measures L.0.21-0.63m, W. 0.18-0.44m, H/D. 0.12-0.14m		L. 1.9m exposed W. 1.16m H/D. 0.15m	Part of 002	ND, AP	
005	North-east to south west aligned wall comprising limestone blocks. Only one course exposed Mortar is a white lime mortar with grit, sand and pebbles- also some red mortar noted. Noted in	006	L. 1.8m exposed W. 1.22m H/D. 0.11m	Foundation for wall.	CA	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	area of eroding saltmarsh near to 'firebox' area 007. Straight edge to NE side SW side is uncertain as not exposed. Limestone blocks measures L.0.32-0.76m, W. 0.33-0.46m, H/D. 0.08-0.121 May be continuation of 001					
006	North-east to south west aligned wall comprising limestone blocks and sandstone fragments. Two courses exposed and no bonding noted. Noted in area of eroding saltmarsh near to 'firebox' area 007. Limestone blocks measures L.0.24-0.5m, W.		L. 3.4 exposed W. 0.84m H/D. 0.25m		CA	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	0.17-0.3m, H/D. 0.19-0.2 Abuts and run parallel with 005					
007	Sandstone block and firebricks forming part of a possible 'hearth/firebox'. Area is burnt and there is evidence of *insitu* slags/industrial residues alongside charcoal. Limestone L 0.28m W. 0.57m H/D. 0.13 Sandstone L 0.19m W. 0.31m H/D. 0.6				LM	
008	Wall adjacent to contexts 005 and 006 in hearth area No measurements			Unsure of location to check	CA	
009	Saltmarsh			Saltmarsh surviving in patches and overlying deposits/ foundations	CA	201
010	Limestone fragments-	Above 011	At least c.13m by	Possible rubble from	CA	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	rubble observed across area to south of building Requires further investigation.		1.11m exposed, expect more to be under salt marsh	demolition and/or foundation base for building as it is contained within the revetment wall 017		
011	Estuarine sand/mud deposits of the Bay. Fine silt/mud Requires further investigation	Below 010			CA	
012	Deposit seen in section directly below grass. Requires further investigation	Below 009			CA	
013	Demolition deposit beneath 012- only seen in section. Fragments of limestone/brick/coal visible within the deposit	Below 012 Above 001			CA	
014	Lower level/foundations of possible revetment wall. Probably a continuation of 016. Metal ?fittings noted in some of the blocks	015, 016, 017	c.3.6+m by 0.4m in width	Possible revetment wall-lower course	CA	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	which may represent a possibly railing or way to secure the stone blocks? One course exposed. Further investigation required. Limestone L 0.4m-1m W. 0.25-0.56m H/D. 0.05-0.13 Sandstone L 0.19m W. 0.31m H/D. 0.6					
015	Upper level of limestone revetment wall- possibly part of second phase? H/D 0.49m	014, 016 and 017	c. 1.65m in length by 0.65m width by 0.49m in height	Possible revetment wall- upper course	CA	
016	Isolated stone in line with limestone revetment wall (014, 015, 017)	014, 015, 017 u	0.77m by 0.56m by 0.20m in depth	Single stone on alignment of revetment	CA	
017	Main section of limestone revetment wall	014, 015, 016	c.6.2m by c.0.7m by c.1m	Large stone blocks forming part of revetments wall and or/jetty. Requires further investigation.	CA	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
018	Alignment of curving stones-part of limestone revetment wall-possible earlier phase?	019	c.3m by c.0.6m	Part of earlier phase of revetment wall?	CA	
019	Continuation of revetment limestone wall 018-possible earlier phase?	018	L shaped? May be up to c. 4.15m in length by 0.4m west-east and c.2.15m in length by 0.40 in width north to south	Part of earlier phase of revetment wall?	CA	
020	Limestone wall foundations, which appears to extend from the chimney towards the building in a easterly direction. Only one course visible. The wall appears to have made use of outcropping bedrock	021	c.4.4m in length by up to 0.75m in width		CA	
021	Limestone wall foundations, which appear to be extending from the chimney towards the building in a easterly	020	c.2.9m in length by 0.40m in width		CA	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	direction. One course visible.					
022	Coal deposits in mortar noted to rear to the chimney. Area of a possible store/waste dump? Requires further investigation.	026?			CA	
023	Wall in hearth area-abutts 006				CA	
024	Curvilinear arrangement of stone. Part of revetment wall-possible earlier phase?				CA	
025	Curvilinear arrangement of stone Part of revetment wall-possible earlier phase?				CA	
026	Stone chimney	Building foundations and possible revetment wall/jetty to east/south-east.	Dimensions taken from previous records Height c.12m by 2m in diameter. The opening to the west	Stone chimney, for ventilation. May be associated with building to the east- copper smelting? Little evidence of burning/residues within	LM	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
			measures 0.9m by 0.55m and is an original feature of the chimney with a stone lintel . An opposing opening on the western site is evident (stone lintel is very clear) but this has been blocked up.	the chimney (R. Ireland pers. comm.) may suggest that it was not used for significant period of time?		
027	Burnt/heat affected deposits, including slag /firebricks etc.		Possible hearth deposits- requires further investigation.			
028	Line of limestone blocks, noted in plan from the aerial image and recorded from aerial plan (not on site)	018/019	c.2.65m in length by c.0.40m in width	Possible foundation- possibly associated with features 018/019?	LM	
100	Limestone blocks forming	101	L 8.45m		KP/SHP	

Context	Description	Associated with	Measurements	Interpretation	Recorded by	CITiZAN Context No.
	sub-rectangular structure- possible jetty. Formed of up to seven courses- only visible in the eastern facing elevation. The seaward (southern end) has the largest stones and is in a better state of repair. Association with building and chimney to north-east is unclear. Size of limestone blocks L 0.14-0.72m H/D. 0.04-0.33m.		W 1.7-2.6m H/D North South			
101	Modern concrete capping of possibly jetty. Installed by LCC in 1990s.	100	L. 8.30-8.50m W. 1.76-1.26 D. 0.07-0.13m		KP/SHP	

Appendix 8: XRF report

Assessment of the ores and slags recovered f
Jenny Browns Point, (Silverdale, Lancashi
by Hand-Held X-Ray Fluorescence Analy

Friday, 22nd July 2016

Assessment of the ores and slags recovered from Jenny Browns Point, (Silverdale, Lancashire), by Hand-Held X-Ray Fluorescence Analysis

10 Introduction

This assessment report presents the results of the Hand-Held X-Ray Fluorescence Analysis (XRF) of ores and slag samples recovered from the possible copper smelting site at Jenny Browns Point, Silverdale, Lancashire The assessment report follows the guidelines issued by English Heritage (Dungworth 2015, 13-14).

The aim of the report is to assess the presence of copper bearing ores and slags, and offer provisional identification for all the material.

11 Methodology and Slag Classification

The bags were assigned an analysis number (JBP1 etc.) which is cross-referenced to the excavation finds numbering system in the tables. The slags were visually examined and analysed by XRF which generated two spectra per sample (details in Appendix 1). One spectra was generated using the instrument at 15kV accelerating voltage which enables the low Atomic Number (Z) elements to detected (elements Mg- Rb) and the higher voltage for all elements >Ca. The spectra were examined and the material was classified on the basis of the elemental profile of the samples.

The debris associated with metalworking, or submitted in the understanding that they are associated with metalworking, can be divided into two broad groups; residues diagnostic of a particular metallurgical process or non-diagnostic residues that may derived from any pyrotechnological process (McDonnell 2001).

The questions relating to the Jenny Browns Point debris are different from the norm and therefore it is not yet possible to be very specific regarding slag classification. Furthermore, some copper smelting processes generate slags that are similar in morphology and composition to iron smelting slags, and are only differentiated on the basis of elevated copper contents in the copper smelting slags. Therefore this study is carried out at a more superficial level with a view to identify ores and slags that are most probably associated with copper working and those that lack sufficient copper to associate them with copper working, and therefore potential evidence for other processes being carried out on the site.

The residue classifications used in the report are defined below; the classification is crude, e.g. ore or slag, because the assemblage is small and the

aim of the analysis is confirm or refute the presence of copper bearing ores and slags on the site.

11.1 Copper based residues

Copper Ore – Ore containing a significant copper content
Copper Working Slag - A silicate slag containing a significant copper content.
Copper Metal(?) – A specimen that has a very high copper content that could either be partially reduced copper ore or heavily corroded copper metal.
Hearth or Furnace Lining - The clay lining of an industrial hearth, furnace or kiln that has a vitrified or slag-attacked face. It is not possible to distinguish between furnace and hearth lining. To be associated with copper working an elevated copper content must be detected on the internal hot (vitrified) face of the lining.

11.2 Other Slags and Residues

Silicate Slag - A silicate slag lacking in elevated copper content.
Clinker – A silica rich slag normally associated with fire-boxes/steam engines and the use of coal as a fuel
Iron Metal – Corroded iron, possibly part of the structure rather than as a product.

12 Results

The assemblage submitted for analysis comprised three groups, based on on-site identification; material classed as copper ore; material classed as iron ore/slag; and a sample of slagged fire brick.

12.1 Group 1 Copper Ores

The samples (Plates 1-3) classed on-site as copper ore are listed in Table 1 with a summary of the XRF analyses. The results of most of the samples are consistent (e.g. Figures 1 and 2), with Cu dominating the spectra with varying levels of iron, silicon and calcium. There is a hints in all spectra for the presence of trace amounts of lead. There are three very different spectra, Sample JBP1.1 (MBP 12/15) has very low iron content and lead was absent. Sample JBP4.2 (MBP 2/15) (Figure 3) contained high levels of calcium (Ca) and iron (Fe); Sample JBP4.4 (MBP 2/15)(Figure 4) which is a curved sample similar to a droplet which contains copper (Cu) Zinc (Zn) and higher lead (Pb) content and is probably a droplet of metallic alloy.

12.2 Group 2 Iron Ores and Slags

There were three bags of samples (Samples JBP5-7, MBP 1/16, 5/15, 6/15), the first two comprised a single sample but Bag Sample JBP7 contained 13 samples of which a sub-set of 8 representative samples were analysed.
Sample JBP5 (MBP 1/16)(Plate 5) appears to be a fragment of clinker, similar to slag generated in a firebox from a steam engine. The XRF analysis (Table 2) showed it is dominated by iron, lime and silica, with only a trace of copper

present (it also contains elevated levels of strontium which is associated with calcium). Sample JBP6 (MBP5/15) (Plate 6) is dominated by iron, and a streak test gives a red colour indicative that it is a piece of ore.
The analysis of the eight fragments from Sample JBP7 (MBP 6/15) (Plates 7a and 7b) showed that there three types of material present (Table 3). There were four examples of iron metal some with attached slag which would suggest that are part of some furnace or hearth structure. There was one example of iron ore (JBP7.4) (MBP 6/15), which was pink/red in colour and hence different to the other example of iron ore (JBP6) (MBP 5/15). There were three specimens of slag, which all displayed slightly different elemental profiles, for example sample JBP7.3 (6/15) showed a high titanium (Ti) content, sample JBP7.6 (MBP 6/15) had a minor but significant zinc (Zn) content.

12.3 Group 3 Furnace/Fire Brick

A fragment of furnace/fire-brick was also sent for analysis (Sample JBP8, Plate 8, MBP 21/15). Both the vitrified hot face and a fractured internal face of the brick were analysed (Table 4). There was no significant difference between the two analyses (with the exception of the lack of potassium in the hot face, which is to be expected). In particular there is no enhancement of copper in the hot face.

12.4 Discussion

The analysis of the possible copper ores (Group 1, Table 1) showed that eight of the eleven fragments are possible ore pieces. The composition is dominated by iron and copper, which indicates specific ore types (Table 5), the most likely being Chalcopyrite, that has been processed, e.g. roasted to remove the sulphur. The XRF analysis cannot confirm that these are ore samples, as it only provides elemental data for elements heavier than magnesium (e.g. oxygen cannot be detected), and confirmation would be required by X-ray Diffraction or other techniques. The three other samples are possibly metal/alloy (JBP1.1 and JBP4.4), and the third (JBP4.2) possibly ore and stone (limestone?).
The examination and analysis of the iron ores or slags (Group2, Tables 2 and 3) showed that there were four types of material present. There were two specimens of iron ore or iron rich stone, (Samples JBP6 and JBP7.4), but of different ore types. There were four fragments of iron metal (Samples JBP7.1, 7.2, 7.5 and 7.8), all of which had adhering slag or clinker indicating they had been subjected to high temperature environments, possibly parts of a furnace or hearth structures. One of the fragments (JBP7.5) showed a fibrous texture of the corrosion indicative of wrought iron. The three remaining samples were grey/black slags (Samples JBP7.3, 7.6 and 7.7), and all showed minor variations in elemental composition (Table 2). However they all contained a trace of coper (as did the other samples in the group). It is difficult to visually differentiate some copper smelting slags from iron smelting slags as they are similar in terms of their chemistry and mineralogy and only varying in the amount of copper present. The spectra from the Jenny Browns Point slags was compared to a spectrum taken form an early copper smelting from the Rio Tinto region in Spain and a typical tapped iron smelting slag from North Yorkshire (Figures 5 and 6).

This demonstrated that the Jenny Browns point slag had enhanced copper levels similar to the Spanish copper smelting slag and the North Yorkshire iron smelting slag showed no signature for copper.
The analysis of the furnace/fire brick showed no major enhancement of copper in the hot face surface of the fire brick.

13 Conclusion

The results of the examination and analysis of the samples from Jenny Browns Point, show that there are fragments of material that are consistent with being processed copper ore. There are also fragments of iron ore. There are pieces of heavily corroded metallic iron that could be fragments of furnace or hearth structures. There is silicate slag present which contain a trace of copper, but further work would be required to confirm that they derive from copper smelting.

References

Dungworth D. (Ed.) 2015 *Archaeometallurgy Guidelines for Best Practice*. Historic England (www.HistoricEngland.org.uk/advice/)

McDonnell J.G. 2001 "Pyrotechnology" in Brothwell, D. and Pollard A.M.P. (eds) *Handbook of Archaeological Sciences*, John Wiley & Sons, London pp. 493-506,

			XRF Summary								
Sample	Finds number	weight (gm)	Cu	Fe	Ca	Si	S	Pb	Zn	Sn	Comment
JBP1.1	12/15	0.6	Y	minor	minor	trace					mostly Cu
JBP1.2	12/15	0.2	Y	Y	y	minor		trace?			mostly Cu
JBP1.3	12/15	0.3	Y	Y	y	y	trace	trace?		trace?	mostly Cu
JBP2	3/15	4.8	Y	Y	y	y		trace?			mostly Cu
JBP3	10/15	0.9	Y	Y	y	y		trace?			mostly Cu
JBP4.1	2/15	3.7	Y	Y	y	y		trace?			mostly Cu
JBP4.2	2/15	3.4	Y	y	Y	y		trace?			high Ca
JBP4.3	2/15	2.0	Y	Y	y	y		trace?			mostly Cu
JBP4.4	2/15	3.5	Y	y	y	y		y	Y		Cu/Zn
JBP4.5	2/15	0.7	Y	y	Y	y		trace?			mostly Cu
JBP4.6	2/15	0.3	Y	y	Y	y		trace?			mostly Cu

Table 1 Summary of Group 1 the copper ores (Y strong peaks, y> smaller peaks)

					XRF Summary									
Sample	Finds number	weight (gm)	Colour	Magnetic	Cu	Fe	Ca	Si	Ti	Mn	Sr	S	Pb	Zn
JBP5	1/16	12.0	black/red		trace	Y	Y	y			Y		trace	
JBP6	5/15	21.1	grey		trace	Y	y	y					trace	
JPB7.1	6/15	136.3	orange	y	trace	Y	Y	y	y	y	y		trace	
JPB7.2	6/15	49.1	orange	y	trace	Y	Y	y		trace	y		trace	
JPB7.3	6/15	37.7	grey/black		trace	Y	Y	y	y	y	y			
JPB7.4	6/15	21.4	red		trace	Y	y	y		trace	trace		trace	

JPB7.5	6/15	25.4	orange	y	trace	Y	y	y		trace			trace	
JPB7.6	6/15	21.0	grey/black		trace	Y	y	y		trace				y
JPB7.7	6/15	12.3	grey/black		trace	Y	y	y		trace				trace
JPB7.8	6/15	24.2	orange	y (weak)	trace	Y	Y	y		y	y			

Table 2 Summary of Group 2 results

Sample	Finds number	Provisional Identification
JBP5	1/16	clinker
JBP6	5/15	iron ore
JPB7.1	6/15	metal with slag
JPB7.2	6/15	metal with slag
JPB7.3	6/15	slag
JPB7.4	6/15	iron ore
JPB7.5	6/15	metal with slag
JPB7.6	6/15	slag
JPB7.7	6/15	slag
JPB7.8	6/15	metal with slag

Table 3 Provisional identification of the iron ores and slags (Group 2)

				XRF Summary								
Sample	Finds number	weight (gm)	Face	Cu	Fe	K	Ca	Si	S	Pb	Zn	Sn
JBP8	21/15	92	internal	trace	Y	Y	Y	y		trace	trace	
JBP8	21/15	92	hot, vitrified	trace	Y		Y	y		trace	trace	

Table 4 Summary of Group 3 analysis

Name	Formula	% Copper
Azurite	$2CuCO_3 \cdot Cu(OH)_2$	55.1
Bornite	$2Cu_2S \cdot CuS \cdot FeS$	63.3
Chalcocite	Cu_2S	79.8
Chalcopyrite	$CuFeS_2$	34.5
Chrysocolla	$CuO \cdot SiO_2 \cdot 2H_2O$	37.9
Covellite	CuS	66.5
Cuprite	Cu_2O	88.8
Malachite	$CuCO_3 \bullet Cu(OH)_2$	57.7
Tennantite	$Cu_{12}As_4S_{13}$	51.6
Tetrahedrite	Cu_3SbS_3 + x(Fe,Zn)6Sb_2S_9	32–45

Table 5 Copper Ores with chemical formulae and approximate elemental copper content

Plate 1 Group 1 Copper Ores Sample JBP1

Plate 2 Group 1 Copper Ores Sample JBP2

Plate 3 Group 1 Copper Ore Sample JBP3

Plate 4 Group 1 Copper Ore Sample JBP4

Plate 5 Group 2 Sample JBP5

Plate 6 Group 2 Sample JBP6

Plate 7a Group 2 fragments in Sample JBP7

Plate 7b Group 2 Sample JBP7 analysed samples (top row JBP7.1 - JBP7.4, bottom row JBP7.5 - JBP7.8)

Plate 8 Group 3 Sample JBP8

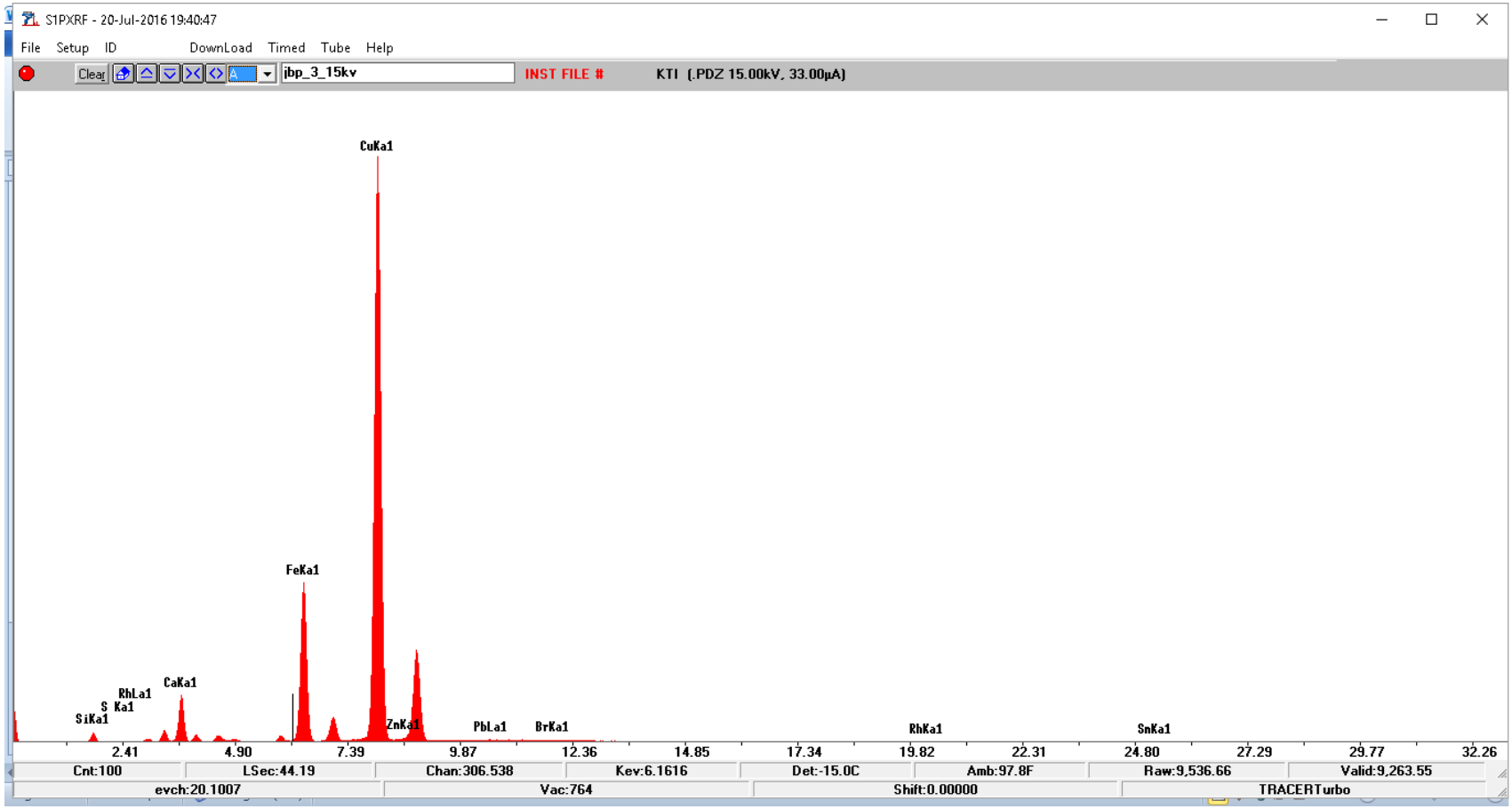

Figure 1 Group 1, Copper Ore, Sample JBP3 15kV spectrum

Figure 2 Group 1, Copper Ore , Sample JBP3 40kV Spectrum

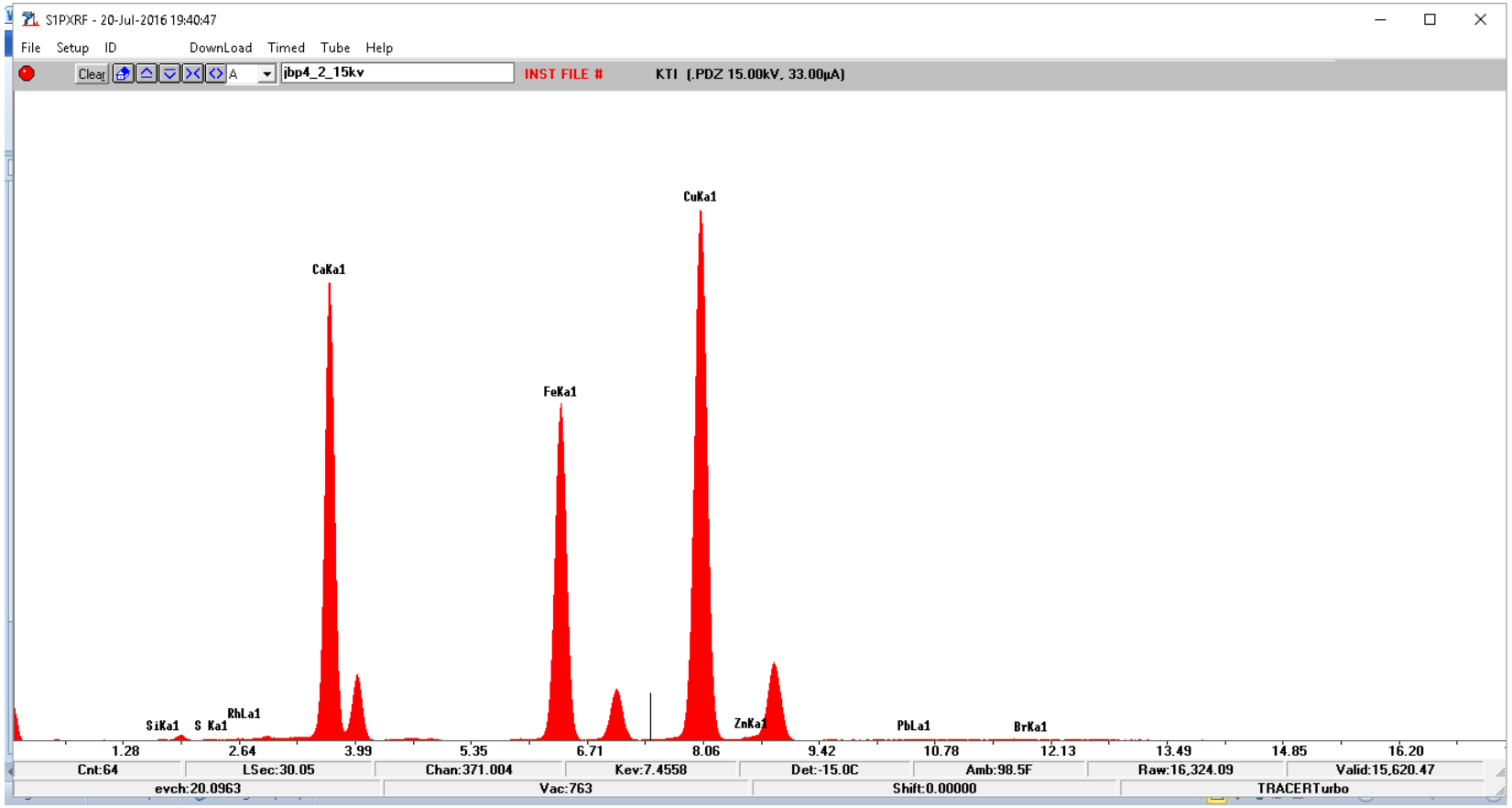

Figure 3 Group 1 Copper Ore, Sample JBP4.2, showing high Ca content

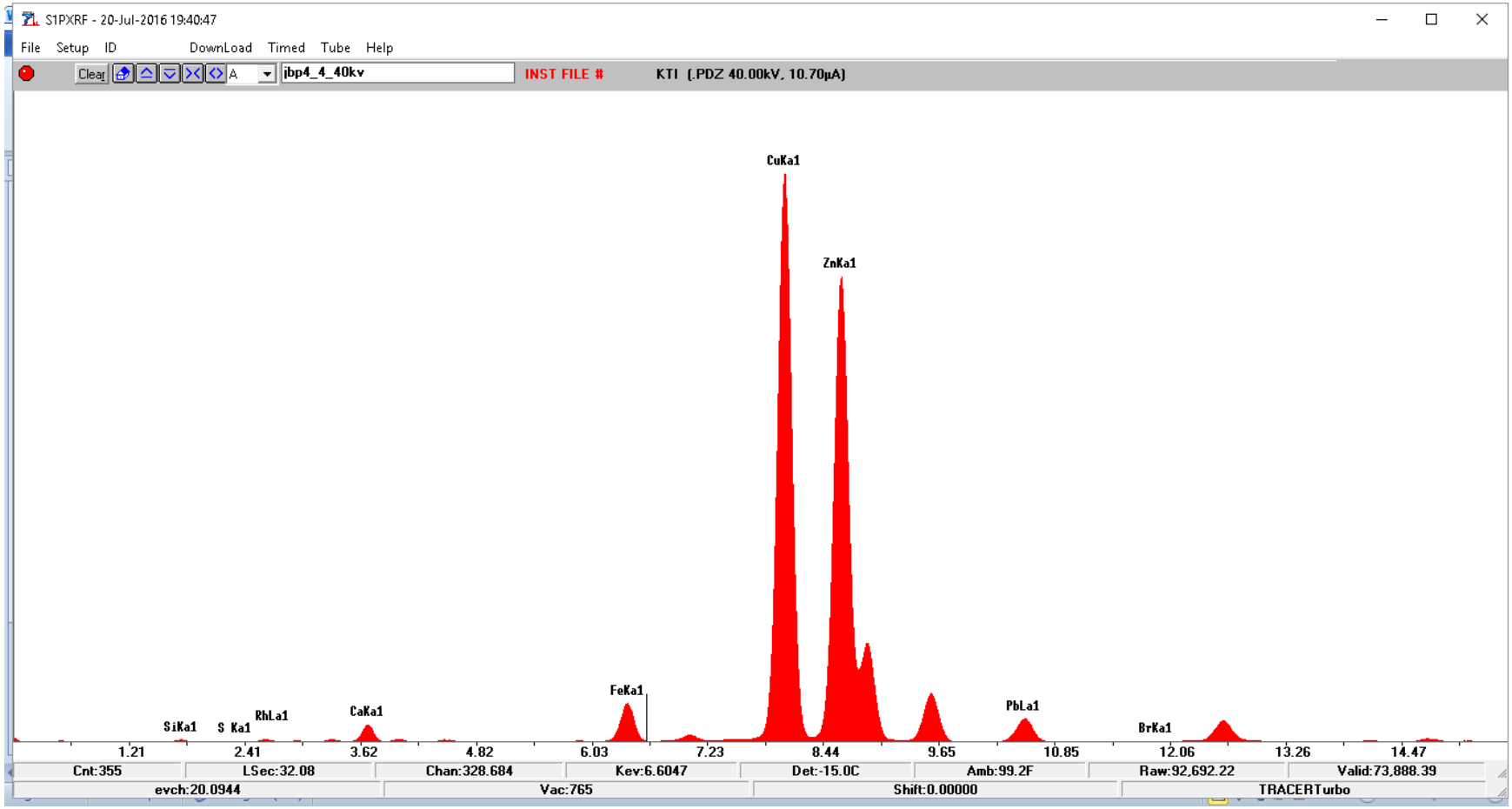

Figure 4 Group 1 Copper Ore Sample JBP4.4 showing high Cu, Zn and Pb peaks

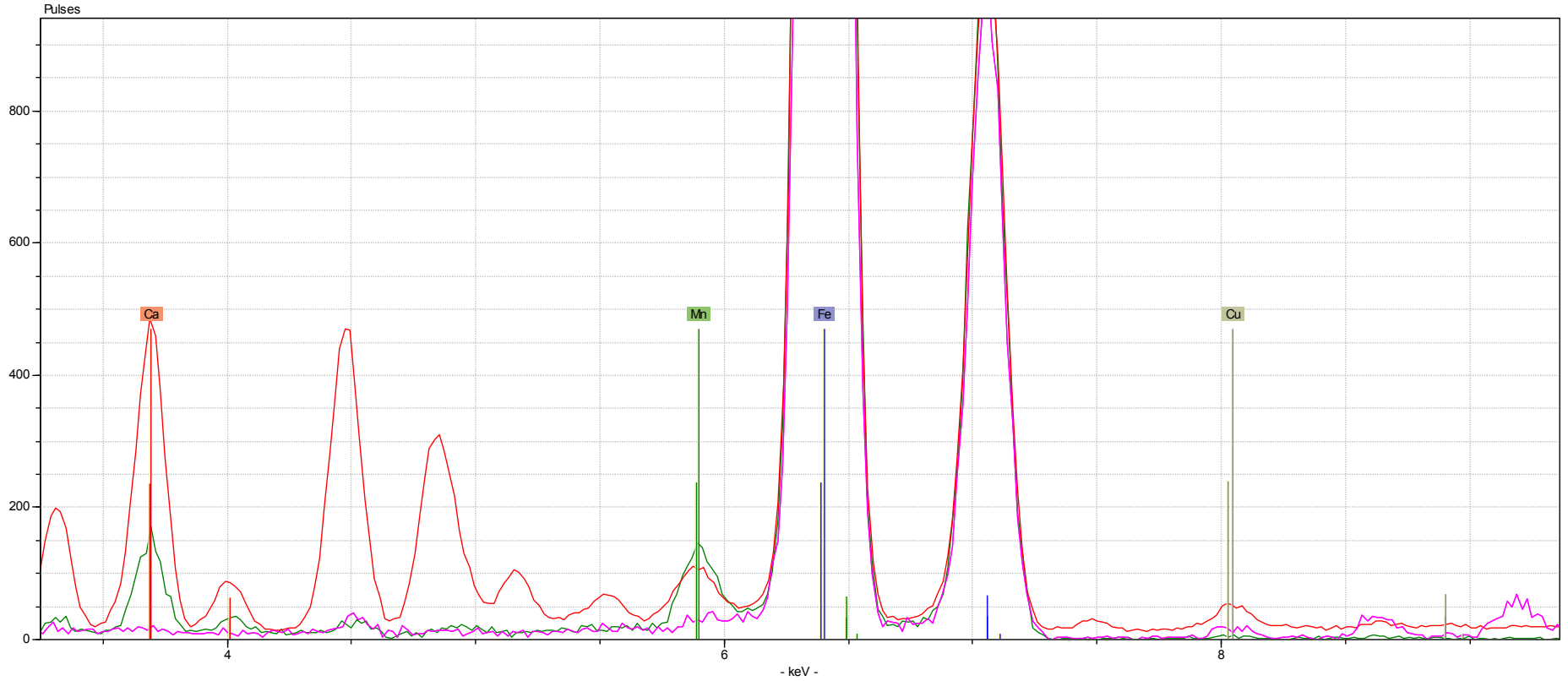

Figure 5 Comparison of the spectra derived from JBP7.3 (red), North Yorkshire iron smelting slags (green) and Spanish copper smelting slag (pink)

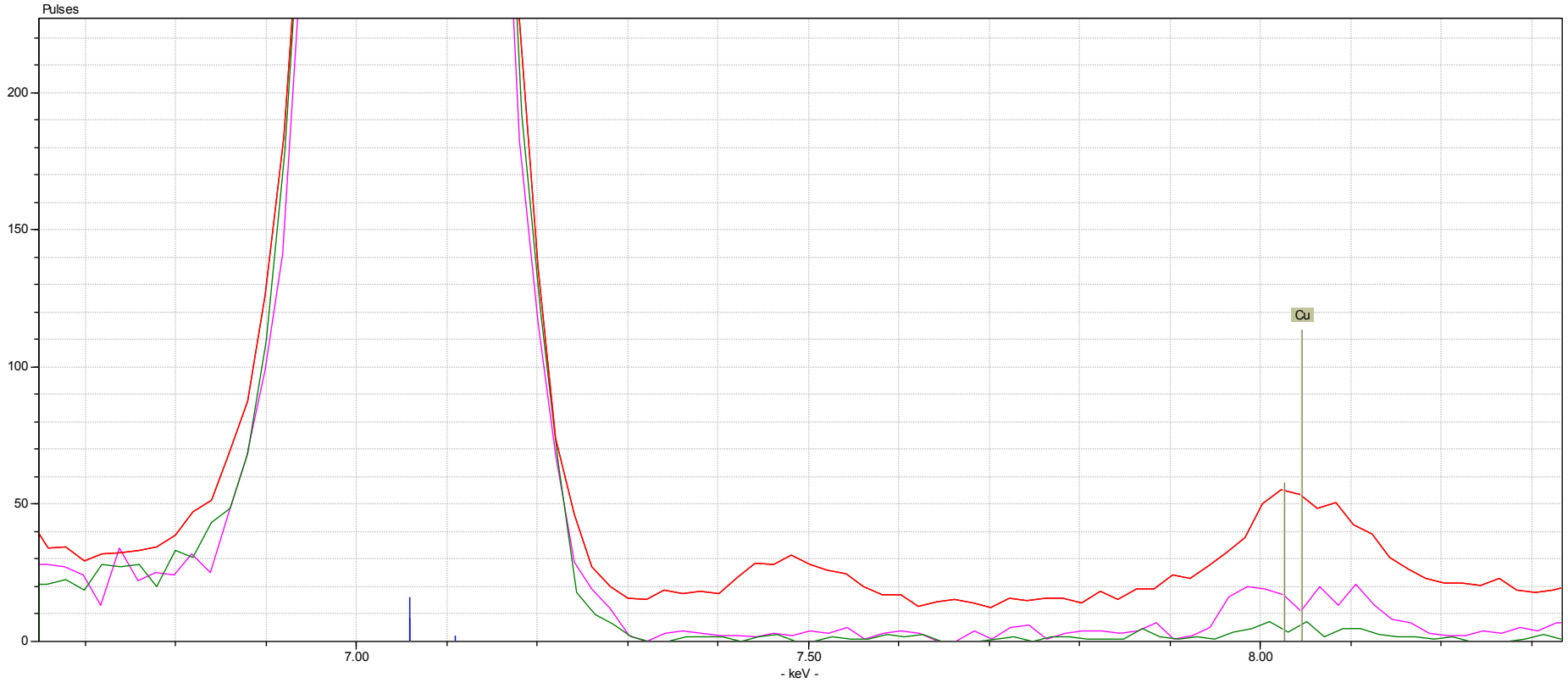

Figure 6 Expanded spectra from Figure 5 showing large Fe k Beta peak (left, 7.0keV) and copper k alpha peaks (right, 8.0keV)

Appendix 1

XRF Methodology

The instrument is a Bruker S1 Turbosdr hand-held XRF instrument operating at 15 kV and 40kV. A beam of x-rays is generated in the instrument and focussed on the sample, the x-rays interact with the elements present in the sample resulting in the emission of secondary x-rays which are characteristic (in terms of their energy and wavelength) of the elements present in the sample. The energies of the secondary x-rays are measured and a spectrum generated showing a level of background noise with peaks of the elements present superimposed on the background noise. Samples were analysed for 30 live seconds, the spectrum is stored. The 15kV analysis examines low Z number elements (>Z=12 (Mg), and the 40kV analysis examines the heavier elements (Z>15 (Ca). Both spectra will detect the main elements of interest e.g. Copper (Cu) and Iron (Fe), but the higher kV spectra are more sensitive.