Hafod Copperworks, Swansea

Hafod Community Excavation Report

June 2014

A report for Swansea University
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GGAT report no. 2014/018
Project no. CA004
National Grid Reference:
SS 66129 94981

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Front cover image: Trench 3 under excavation, view to the west.

Summary

The Glamorgan-Gwent Archaeological Trust Ltd (GGAT Projects Division) were commissioned by Swansea University to undertake an community archaeological excavation of the Hafod Copperworks. An archaeological programme of works was developed by GGAT and Swansea University, to excavate and record the archaeological remains revealed by the community excavation. This report forms the quantative basis and assessment for the full archaeological report.

Three trenches were opened, by hand, as part of the Hafod Community Excavation. Trenches 1 and 2 (both intended as 10x4m) were excavated in the area of the canal basin, but had to be abandoned after a few days because of contamination problems that had not been previously identified. Trench 3 was then excavated to further examine the area of canal bridge approach at the main entrance to the Hafod Copperworks.

An open day on the 8th June allowed members of the public to attend guided tours of the excavation, whilst some volunteers continued to excavate Trench 3 with Johnny Crawford and Sophie Lewis, and others continued finds processing with Charlotte Halford.

Acknowledgements

This project was managed by Dr Edith Evans, PhD (Heritage Manager). The report was written and compiled by Charlotte Halford, BA, (Project Archaeologist) and Andy Sherman, BA, AIFA (Assistant Project Officer). Specialist assessments were provided by Rob Dunning (GGAT), Charlotte Halford (GGAT), Rowena Hart (GGAT), Richard Lewis (GGAT), and Andrew Sherman (GGAT). Illustrations were prepared by Paul Jones (Senior Illustrator, GGAT). A special acknowledgement goes to all of the volunteers who took part in the excavation and finds processing.

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Abbreviations

GGAT:	Glamorgan Gwent Archaeological Trust
LB:	Listed Buildings Grade I, II and II* (Cadw)
NGR:	National Grid Reference
NPRN:	National Primary Record Number (in NMR)
PRN:	Primary Record Number (in SMR)
RCAHMW:	Royal Commission on the Ancient and Historical Monuments of Wales
SAM:	Scheduled Ancient Monument (Cadw)
HER:	Historic Environment Record (curated by the Glamorgan-Gwent Archaeological Trust)

1 Introduction

1.1 Project background and commission

The Glamorgan-Gwent Archaeological Trust Ltd was commissioned by Swansea University to undertake a community archaeological excavation of the Hafod Copperworks. An archaeological programme of works was developed by GGAT and Swansea University, to excavate and record the archaeological remains revealed by the community excavation. The community excavation was undertaken between 29th May 2013 and 10th June 2013.

1.2 Location, topography and geology

The current area of works, which comprises approximately 10% of the former area of the Hafod/Morfa Copperworks, along their western side, is terraced into the valley slope. It comprises two main levels:

- An upper level, averaging 40m in width, on the level of the canal.
- A low level on the level of the floodplain and the bulk of the works.

This placement was deliberate. Coal was emptied from canal barges, at the upper level, to supply copper smelting halls situated on the floodplain. The difference in level is only 1m at the north end of the site, but increases to approximately 5m at the south end (Ludlow 2002, 14).

The Hafod/Morfa Copperworks are themselves part of an extensive industrial complex dominating the lower Tawe valley. This includes one of the last surviving assemblages of 19th century industrial buildings left in Swansea, and the sites of these works still define the landscape, and certainly influence the settlement and communications pattern (Poucher 2008, 3).

The current archaeological works were limited to the far western edge of the site, with the western boundary of the area formed by the line of the Swansea Canal. Trenches 1 and 2 were located on the site of the former copperworks canal dock at NGR SO 66123 95089. Trench 3 was located on the eastern approach to the bridge crossing the Swansea Canal, leading to the copperworks entrance. This third trench was located at NGR SO 66127 94981.

Located a short distance to the northeast of Trench 3 is the upstanding remains of the Hafod Copperworks lime kiln (PRN 02425w, NPRN 85021, LB 11694), surveyed by the children of the Dylan Thomas Community School as part of the larger community outreach programme.

The soils over the excavation area are largely un-surveyed but are likely to include alluvium associated with the River Tawe and substantial peat deposits (SSEW 1983).

The geology generally comprises the South Wales Upper Coal Measures formation, which is made up of Mudstone, Siltstone, Sandstone, Coal, Ironstone and Ferricrete and ranges between the geological ages of Westphalian D to the Bolsovian (Westphalian C). This sedimentary deposit would have formed between 306 and 308 million years ago within the Carboniferous Period, and would have been dominated by rivers which deposited sand, gravel detrital material, silt and clay.

2 Historical and archaeological background

2.1 History of the Hafod and Morfa Copperworks

Hafod Copperworks was, at its peak in the mid-19th century, the largest in the world, with the greatest output. Morfa followed closely behind and between them, the thirteen copperworks in the Lower Swansea Valley accounted for 90% of the world's copper production (Hughes and Reynolds 1989, 11).

The copper-smelting industry which developed in Swansea from the beginning of the 18th century was based on the plentiful supply of coal in the area, notably in the Swansea Valley, and the excellent facilities for shipping, which allowed the import of copper ore. Water transport facilities with the hinterland were greatly improved in the last two decades of this century through the construction of canals, particularly the Swansea Canal between 1794 and 1798.

Both Hafod and Morfa Works were established on greenfield, if not virgin sites, shown empty on a map of the 1790s and owned by the Duke of Beaufort from whom the Hafod and Morfa sites were initially leased (tithe map, St John-juxta-Swansea parish, 1844). A long field boundary, shown on both maps, persisted as the boundary wall between the two sites until the 1980s (Ludlow 2002, 14).

The Hafod Copperworks were founded in 1808-09 by a Cornish mining entrepreneur, John Vivian. He had already established himself in the south Wales coalfield, at Penclawdd on the Burry estuary, but now considered that it would be more efficient to open a new smelting works at Swansea. The site he chose lay between the Swansea Canal to the west and the River Tawe to the southeast, allowing for efficient water transport of raw materials to the site, both by canal barge from the upper Swansea Valley and by ship from elsewhere in Britain. The site was laid out to maximise the potential for the expansion of the works. Although the southern end of the site fell steeply to the river-bank, the northern part included a large flat area of alluvium. The entrance to the works was via a bridge over the canal, to the northwest of the point at which the surviving (but later) engine houses stand.

By 1810, a dedicated canal basin had been constructed at the northern end of the works, to offload coal from the barges into the works. Maps and plans drawn up later in the 19th century show that the original north-south basin was increased by the addition of an extension to the east, almost at right-angles, and that a network of narrow-gauge rail- or tramways was constructed to deliver the coal from the basin to the rear of the copper-smelters.

A rolling mill was added to the smelters in 1819 and the facilities were further expanded over the course of the century, to enable the works to increase output and adopt improved technology. However, open land was no longer available and new installations had to be fitted into an increasingly cramped site. Initially, slag was tipped to the east of the works (the eventually site of a sulphuric acid plant), but in 1865 a new tramroad was built carrying the waste over the cabal to the west. At about the same time, a new office building (now the Landore Social Club) and locomotive shed were added and an engine house rebuilt (Wiggins 2004b, 5).

Increase in output led to increased slag disposal problems, which was partly dealt with by improving the intra-works tramroad networks to enable it to be moved to the expanded tips, and partly by finding uses for this material, principally for building in the form of cast blocks.

In 1910 a further phase of rebuilding was undertaken, with the construction of a further engine house (engine still *in situ*). However, smelting ceased in 1904 (Wiggins 2004b, 5).

Development of the Morfa site, immediately to the north of the Hafod, started with the construction of a rolling mill by a rival consortium Williams, Foster and Co in 1828 to process the output of the Rose Copperworks in Plasmarl. Copper smelting facilities were added in 1835. The main feature of the site was a large rolling mill (now the stores for Swansea Museum) parallel to the canal and an engine house and furnace to the south. A new office building was built on the west bank of the canal *c*1900 (Wiggins 2004b, 6).

As at the Hafod, the facilities were continually enlarged and upgraded to remain on the cutting edge of copper production. The locations of the principal installations (smelting halls, rolling mills, power houses, and laboratory) are well known, being labelled on successive plans. However, the purpose of some of the smaller buildings is not always clear. Entrance to the Morfa Copperworks was also via a bridge over the Swansea Canal.

The Swansea Canal is recognised as having made an important contribution to the early development of the Port of Swansea. Built by the Swansea Canal Navigation Company and completed in 1798 at a cost of almost £60,000, the Swansea Canal linked the river wharves of Swansea Harbour with the coal mining and metal manufacturing industries of the Swansea Valley (Swansea and Port Talbot Docks, 2014). However, competition from the Swansea Vale Railway, and later from the GWR's own line between Swansea and Morriston, eventually lead to a substantial reduction in canal-borne traffic, and the Swansea Canal showed its first working loss in 1895. Its final year of being marginally in profit was 1902, and in 1921 the total amount of cargo carried was just 10,600 tons. The lower section of the canal was closed and filled in shortly after the First World War, and traffic ceased completely when the last cargo of coal was carried from Hill's Colliery, Clydach, in 1931 (Swansea and Port Talbot Docks, 2014).

By 1902 the Swansea Canal was no longer profitable and became disused, finally closing in 1931. It was in-filled both naturally and deliberately, a process which, in the copperworks area, was completed by the 1970s. Where it runs through the Hafod/Morfa site it is completely dry on the surface, but beneath its in-filled bed it features a massive drain complex that still facilitates its flow (Cambria Archaeology 2008, 17).

The Hafod and Morfa works were merged as British Copper Manufacturers in 1924 and then taken over by Imperial Chemical Industries (ICI) in 1928 and operating as Yorkshire Imperial Metals, focused on the manufacture of copper items rather than copper smelting, although copper rolling continued through until closure. The organisation was rationalised; the Morfa powerhouse became the canteen and the Hafod office was sold. The works were finally closed in 1980 (Hughes and Reynolds 1989, 12). The majority of buildings on both sites have now been demolished, the slag heaps removed, and a substantial area of the land on which they stood is now owned by the City and County of Swansea.

Recent archaeological investigations

During 2002 a desk-based assessment was produced for the Landore park and ride scheme (Locock 2002). The assessment identified a total of twenty-one buildings and structures associated with the Hafod and Morfa Copperworks were still extant within area of the two works. At the time of the survey this included a single Scheduled Ancient Monument (Gm483) and ten Listed Buildings. The assessment also identified the locations of fourteen demolished buildings, of which buried remains may survive intact.

Later in 2002, a site appraisal for the Hafod/Morfa Copperworks was completed (Ludlow 2002), which defined the preservation of each building and structure on the site and established individual manager plains for each heritage asset.

In March 2004 an archaeological watching-brief was conducted on the excavation of ground contamination testing test-pits (Wiggins 2004a). A total of eighteen test-pits were excavated across the site of the copperworks. Some of the eighteen test-pits confirmed a depth for natural on this site, whilst other test pits revealed solid structures. Unfortunately due to the nature of the test-pits it was not possible to examine these structures further. The watching-brief established that there had evidently been episodes of demolition and dumping in the area, identifiable not only from the copious amounts of copper-slagpresent in the test-pits, but also from the presence of building debris and more modern waste, dating from after the closure of the copperworks.

In November of the same year a building survey was conducted on a section of the Swansea Canal wall (identified as LRP03) that was to be demolished to make way for the bus lane. LPR03 was originally part of a line of offices sited on the east bank of the Swansea Canal. The line of these offices followed and represented the line of the canal side boundary wall that continued to the north of LPR03, preserved within a later structure (termed YIM 39 in Cambria Archaeology 2002), and to the south as a wall averaging 3.5m in height and composed of copper-slag block, sandstone and brick. The lower parts of this canal side wall consisted almost entirely of copper-slag blocks, representing the earliest phase, but the wall has been subsequently raised in stone and slag (Cambria Archaeology 2002). While it was impossible, due to the ruinous state of the LPR03, to confidently phase the remains of the wall, it was possible to date its original construction to before 1835 as the buildings of which LPR03 is a part are suggested on the 1835 Railway Deposited Plan (Cambria Archaeology 2002). The Swansea Canal itself was dug in 1784 and the Hafod Copperworks constructed in 1808-1809. The origins of LPR03 lie therefore in the years between the building of the canal and the early years after the founding of the Hafod Copperworks (Wiggins 2004, 9).

A second desk-based assessment was conducted on the area of the Hafod/Morfa Copperworks in 2008 by Cambria Archaeology. This assessed the current condition of all buildings and features on the site (including an eleventh Listed Building) and revised the individual building management plan published in Ludlow 2002.

Cambria Archaeology also produced an environmental impact assessment in 2008 for the Morfa Distributor Road (Poucher 2008) which is intended to follow the line of the southern section of the Swansea Canal as it passes through the Hafod Copperworks before joining an enlarged carriageway shadowing the line of the current bus lane. This work built upon the survey conducted during Ludlow 2002 and provided appropriate mitigation to protect the archaeological record of the Hafod Copperworks.

3 Methodology

3.1 On-site methodology

The volunteers (40 in total, see Appendix V) and three supervisors (Johnny Crawford (GGAT), Sophie Lewis (GGAT) and Charlotte Halford (GGAT)) under the direction of Andy Sherman (GGAT) opened three trenches (Trenches 1, 2 and 3), by hand, as part of the Hafod Community Excavation.

Trenches 1 and 2 (both intended as 10x4m) were excavated in the area of the canal basin, but had to be abandoned after a few days because of contamination problems that had not been previously identified. Trench 3 was then excavated to further examine the area of canal bridge approach at the main entrance to the Hafod Copperworks. The volunteers who were less able-bodied were given finds washing and the opportunity to do some recording of the canal wall (Plate 14, see Appendix IV) which involved scaled drawings and photography.

A written and photographic record was made of all archaeological features and deposits in accordance with the *GGAT Manual of Excavation Recording Techniques.* Contexts were recorded using a single continuous numbering system (indicated in bold e.g. **1000**) and are summarised in Appendix II. A full photographic record was made using a 9 megapixel (minimum) digital camera.

All classes of finds have been retained, cleaned, and catalogued and remain in temporary store until arrangements for final deposition are agreed, in line with the requirements of the Institute for Archaeologists' *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials* (2001). When substantial quantities of modern material were recovered, an on-site policy of record and discard was implemented.

The project archive will be deposited with an appropriate receiving organisation, in accordance with the UKIC and IFA Guidelines. This archive will comprise the site archive, research archive, artefacts and ecofacts, subject to the agreement of the site owners. A copy of the archive index will be deposited with the National Monuments Record (RCAHMW) Aberystwyth.

3.2 Post-excavation methodology

All reporting has been carried out to the professional standards of the *Institute for Archaeologists* and to the post-excavation guidelines laid out in the English Heritage MAP2 (*Management of Archaeological Projects 2*) document. The process set out in MAP2 details a two stage approach to the post-excavation of archaeological sites, a rapid assessment of the archive followed by informed analysis and reporting (Halford, 2013).

All recovered artefacts were processed, catalogued and sent for specialist assessment with a synthesis of the resulting reports reproduced here (Section 6). The individual specialist reports include an assessment of the artefactual assemblages and their potential for further study. All primary site records were digitised and collated to form a comprehensive digital archive.

An initial structural report was written which divided the site into three areas. A plan has been produced to show only the most significant features of the site (Figure 2) and a summary description of these contexts can be found with the Site Summary below (Section 4).

It is intended that the site archive (including artefacts and ecofacts) will be deposited with an appropriate receiving organisation, in accordance with the ICON (formerly UKIC) and IfA Guidelines (Archaeological Archives: a guide to best practice in creation, compilation, transfer and curation (2007)), and subject to the agreement of the legal landowner. A copy of the archive index will be deposited with the National Monuments Record, RCAHMW, Aberystwyth.

4 Site Summary

Three trenches were opened by the volunteers and supervisors. Trenches 1 and 2 (both intended as 10x4m), supervised by Johnny Crawford and Sophie Lewis (GGAT), were excavated in the area of the canal basin, but had to be abandoned after a few days because of contamination problems that had not been previously identified (Plates 1 to 3). Trench 3 was then excavated to examine further the area of cobbling at the main entrance to the Hafod works that had been left uncovered during the landscaping works (Plates 4 to 9). Whilst the trenches were being excavated, finds processing, photography and drawing was undertaken by a few of the volunteers under the supervision of Charlotte Halford (GGAT).

4.1 Trench 1

Trench 1 was supervised by Johnny Crawford and was excavated by volunteers. Removal of topsoil had started to reveal an L-shaped concrete and stone structure (**1006**) with evidence for early – mid-19th century mortar which showed some signs of modern intervention in the form of drainage and concrete repairs/capping. Abutting this concrete and stone structure was a deposit of modern, machine-made bricks (**1007**), thought possibly to be the fill of a drain (Plate 6).

It is likely that the concrete and stone structure (**1006**) represented the edge of the canal basin, but as excavation had to be terminated, it was not possible to ascertain this for certain.

4.2 Trench 2

Trench 2 was supervised by Sophie Lewis and was excavated by X volunteers. Topsoil removal did not proceed far enough to reach stratified historic levels (Plate 7). Trenches 1 and 2 were abandoned as the area was found to contain asbestos, and it was decided that Trench 3 would be opened as an alternative.

4.3 Trench 3

This trench expanded the area of cobbling leading from the main entrance of the Hafod works onto the canal bridge. This cobbled surface (**3003**) was constructed from two parallel rows of rectangular stone slabs separated by rectangular cobble setts (Plate 9).

On the southern side of the cobbled surface, the pathway leading down to the towpath (**3018**) was identified, flanked by a drain (**3019**, Plate 9). However, there was limited evidence for a corresponding pathway on the northern side of the bridge (**3027**). This would appear to suggest that the canal bridge was either originally built to be high enough to permit horses to pass underneath or had been reconstructed to be so, unlike some of the bridges further up the canal. A short section of drain (**3004**) was identified on the northern side of the cobbled surface, but could not be followed for any distance because of Japanese knotweed.

Evidence for heavy wagon use was noted, in the form of wear marks (**3012**) on the outer edge of a series of cobles forming the approach to the bridge (Plate 10).

The southern parapet of the bridge (**3020**) had been removed to a level below the cobbled surface, although at least two courses of stonework were identified as remaining *in situ* (Plate 11). Both had been truncated, presumably when the bridge was removed, but it is unclear exactly what form the demolition took, as a modern cable trench (**3022**) had cut through all levels at the western end of the trench, making it impossible to see whether any of the bridge fabric survived further west.

The remains of a wooden sliding door (**3014**) at the entrance to the copperworks were discovered in an aperture (**3013**) immediately to the west of the wall (**3031**) that formed the northern half of the works entranceway. The northern portion of the copperworks wall (**3031**), in the area of Trench 3, was formed by two distinct structures. The northern most

section of the wall (**3028**) was stone-built and comprised of the external wall of a building pierced by a blocked doorway and the remains of a window opening. Abutting the southern end of wall **3028** was a short section of stone-built wall (**3029**) that formed one side of the entranceway to the copperworks. The wall **3031** was recorded in Wiggins 2004 as structure **LPR03** and as **YIM41** in Cambria Archaeology 2002. A section of this wall, to the north of **3031**, was destroyed during the construction of the Swansea bus lane.

The wall that comprised the southern side of the copperworks entrance in the area of Trench 3 (**3032**) was constructed in three phases with an original stone construction (**3024**) extended vertically with Vivian patent bricks (**3033**) and then supported to the rear with a red-brick abutment (**3034**). This section of the wall formed the northern end of Listed structure **LB16881**. The north-facing section of the wall (that forming the entranceway) had iron hinges protruding from it, possibly suggesting the original entrance to the copperworks had a swing door/doors, rather the later sliding door.

The finds assemblage was small and presented few points of interest. However, a possibly 19th century hammer was recovered from Trench 2.

During recording of the standing walls that formed of the channel between the canal and the basin, a crucible was noted and recorded *in situ* (Plate 12).

5 Site archive

5.1 Archive quantification

Following completion of the fieldwork, the site archive was consolidated, and quantified (see below). All documents were digitised by entry onto databases, scanning or downloading as appropriate.

The primary archive inventory comprises **48** contexts of which 21 are deposits, three negative features, a single fill, eighteen structures, two group numbers and one unstratified finds category.

A total of nineteen drawings were made, of which six were training exercises in plan drawing of the cobbles in Trench 3, seven were plan drawings, two were sketch elevations, and four were plane table plans. In addition, a total station survey generated floor plans of the site which have enabled CAD drawings to be compiled and illustrative figures produced.

One sample was taken from the site to assess the mortar bonding the bridge in Trench 3.

The photographic archive consists of 800 digital photographs taken over the course of the excavation.

6 Specialist artefactual and environmental assessments

Following completion of the fieldwork all bulk finds were washed, sorted, re-packaged in labelled bags and stored in labelled museum storage boxes. All finds were quantified by type and context, and this data, along with the sample data, entered onto a database. The assemblage was then submitted for specialist assessment, with the exception of the geological material, which was not considered to be of archaeological interest.

In addition to the bulk finds, one mortar samples and seventeen brick samples were recovered. The artefactual and sample assemblage is summarised in Table 1.

Table 1: Finds and samples assemblage summary

Type	Total finds	Samples
Glass	21	-
Pottery	16	-
Metal objects	10	-
Geological	17	-
Mortar	-	1
Brick	-	5

6.1 Glass - Rowena Hart (GGAT)

Introduction

A total of 22 fragments of glass were presented for analysis from excavations conducted at the Hafod Copperworks, Swansea. The glass was recovered from five different contexts (**3000**, **3001**, **3002**, **3004** and **3006**), one of which was a number attributed to unstratified finds (**3000**). Of these fragments, seventeen were modern vessel or window glass (see Table 1 below) and require no further discussion. Four fragments of Codd bottle were recovered from two different contexts (**3000** and **3001**); these were not further identifiable as no embossed lettering survived on the fragments.

An almost-complete glass battery rest insulator was recovered from context **3004**. This was manufactured by the Kilner Brothers glass works in Thornhill Lees, Dewsbury. The works was founded in 1848 by John Kilner on the site of an existing glass works. The upper surface of the insulator retains the following embossed:

'..R BROTHERS…DEWSBURY…'

The underside shows a pontil scar. It is thought that these insulators supported the legs of large battery storage containers used to provide DC power to early telegraph circuits and railway signals.

This is the only object from the assemblage required to be retained.

Context Number	No of fragments	Min Count	Colour	Type of Vessel	Date	Description
3000	1	1	Green	Bottle	Modern	Body fragment
3000	1	1	Green	Bottle	Modern	Small rim fragment
3000	3	1	Pale aqua	Codd bottle	L19-M20thC	Three fragments of a Codd bottle
3000	1	1	Colourless	Bottle	Modern	Base fragment
3001	4	1	Brown	Bottle	Modern	Including base
3001	1	1	Colourless	Window glass	Modern	
3001	3	2	Colourless	Vessel	Modern	
3001	1	1	Pale aqua	Codd bottle	L19-M20thC	Base fragment of a Codd bottle
3002	1	1	Colourless	Bottle	Modern	Base fragment AB… embossed on base
3004	1	1	Mid aqua	Battery rest insulator	1898-1910	A battery rest insulator
3006	3	1	Colourless	Window glass	Modern	Obscured glass fragments
3006	1	1	Colourless	Bottle	Modern	Bottle fragment including 30ml and 30mm embossed
3006	1	1	Colourless	Bottle	Modern	Base fragment

6.2 Brick – Charlotte Halford (GGAT)

Introduction

During the Hafod Community excavation, a total of five examples of ceramic building material (brick and tile) were retained for analysis. Of these were four structural red bricks and one floor tile, none of which contained any identifiable stamps. These were examined visually in order to characterised size and shape, any markings, and colour. The evolutions of brick types over time in the UK is well established (Harley 1974), but the samples recovered from the Hafod Copperworks may not conform to this sequence because they were possibly manufactured locally outside the regional/national market. The absence of frogs and stamps restricts the information that can be established from the assemblage.

The assemblage has been arranged cataloguing the bricks in numerical order based on the context from which they came.

Catalogue

Sample	Context	Type	Description	Size (length x width x depth)
001	3001	Brick	Damaged orange brick, 20th century. One oval hole runs lengthwise down the centre of the brick, measuring 170mm x 70mm x 25mm. There is an indent or lip down one length, running 5mm below the top of the brick. There are white mortar concretions on all sides.	170mm x 110mm x 80mm
002	3001	Brick	Complete 20th century orange brick with two holes running the length of the centre of the brick. Each hole measures 230mm x 35mm x 35mm. There is a one centimetre gap between the two holes. It appears handmade due to marks in the brick produced during the drying phase of the brick production; therefore it is possibly made locally.	230mm x 110mm x 65mm
003	3001	Tile	Ceramic floor tile fragment, modern, with heat damage on the edges and a red centre. The underside has a rectangular pattern for adhesion. Some mortar remains on the underside and edges of the tile.	75mm x 65mm x 25mm
004	3006	Brick	Part of a modern brick with a hole going lengthwise through the centre of the brick. The depth of the brick has been broken. Score marks within the hole are regular and appear machine made.	230mm x 80mm x 40mm

Sample	Context	Type	Description	Size (length x width x depth)
005	3006	Brick	Small fragment of brick with a hole through the centre measuring 70mm in width. There are still some white mortar concretions.	13mm x 115mm x 40mm

Discussion

Most industrial activity in south Wales was associated with the use and manufacture of bricks. The occurrence within the coal levels of suitable clay deposits interleaved with Swansea-area coal seams meant that clay was a by-product of mining, while the coal could supply fuel for firing. Coal mines typically manufactured bricks for use in construction of their buildings and other structures, and since rail links were constructed to transport coal, they could also be used to market bricks to industrial and commercial concerns (Locock 2011), the Hafod Copperworks being one. These brickworks were poorly documented and the survival of recognisable stamps on the bricks themselves is often the only firm indication of their provenance.

Several clay mills (pug mills), or clay pits were in use in the mid-1700s. The White Rock Copperworks (1737), situated 1.3 miles southeast of the Hafod Copperworks, is recorded as having a clay mill (i.e. pug mill) that would have been used in the preparation of local fire clay. A detailed map of the hillside adjacent to the Forest Copperworks (1747-52) shows three 'old clay pits' flanking the coal-road descending from Tirdeunaw and Tre-boeth Collieries (Hughes 2000).

The majority of the brick samples recovered from the Hafod Copperworks were handmade structural red bricks which date to the late-19th/early-20th century. The bricks retained from the Hafod Copperworks had holes lengthwise through the centre. This was to evenly distribute the heat during the firing process and enabled them to provide greater stability to walls, foundations, chimneys and other structures. Brick sample **001** has a lip down one edge of the stretcher; this is common before the use of frogs (indents in the centre of the brick) and was to hold the mortar in place between the bricks.

Conclusion

The bricks were all from Trench 3 which was situated at the entrance to the Hafod Copperworks and bridge over the canal. The contexts **3001** and **3006** are both deposits abutting the north-south walls to the entrance of the Copperworks. **3006** was a deposit directly above **3004** northwest-southeast cobbled surface or drain. Therefore, although the bricks probably relate directly to the Hafod Copperworks, they are from backfill deposits, and are in effect unstratified.

6.3 Hand tools – Richard Lewis (GGAT)

A single unstratified iron (Fe) hammer (Plate 1) was submitted for analysis. The object was subjected to limited cleaning of oxidised surfaces. The object was weighed before cleaning to 790g and after cleaning to 700g, with a total corrosion loss of 1.27%.

The hammer object consists of a double cross peen hammer head and tubular haft. The hammer head is 125mm long, 30mm wide at the cheek and tapering to a vertically aligned peen on one end (30mm long, angled 18º) and an opposing horizontal peen (width of head – 30mm, angled 18º). Both vertical and horizontal heads taper to a flat face 4mm in width. The haft is also iron, 18mm in diameter and hollow; overall width of the haft tubular wall is <4mm. Only 109mm of the haft length survives with an obvious forced break compressing the tubular frame. Unusually, the haft only sits halfway into the eye of the hammer head. Both haft and hammer head show oxidisation on all surfaces.

Double cross peen hammers are used by metal workers and engineers; cross peen hammers are often called engineer hammers. Cross peen hammers are utilised during forging, where the cross peen is used to make the hot metal stretch and for activities such as riveting, where the cross peen is useful for spreading or “peening” rivet heads, and sheet metal working.

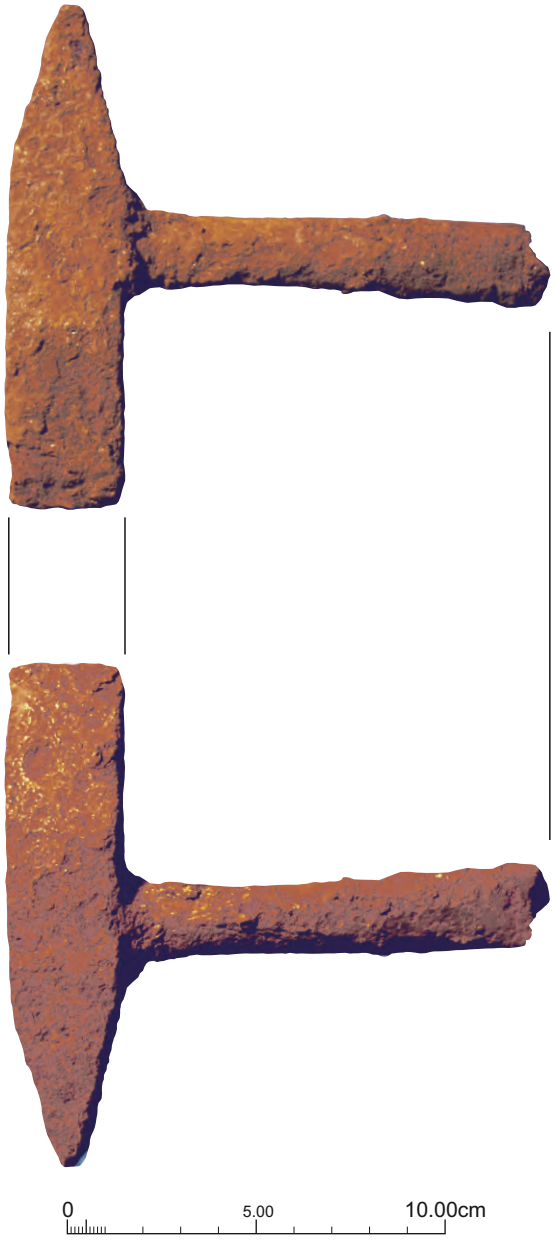

Plate 1. Unstratified iron (Fe) hammer used by metal workers and engineers (shown 50% actual size)

6.4 Other metalwork – Andy Sherman (GGAT)

A small selection of modern metalwork was recovered from the site, none of this material was of archaeological significance.

Context	Material type	Description	Quantity	Weight (kg)	Period
3000	Steel	Window bolt	1	-	Modern
3000	Steel	P-pin	1	-	Modern
3001	Steel	Windscreen wiper	1	-	Modern
3002	Copper alloy	O-ring	1	-	Modern
3004	Iron	Section of vehicle suspension	1	-	Modern
3006	Iron	Iron pipe. T-section with diameter of 15mm	1	-	Modern
3008	Iron	Hinge	1	-	Modern

6.5 Post-medieval and modern pottery – Andy Sherman (GGAT)

Introduction

A small assemblage (total sherd count: 20) of Post-medieval and modern material, mostly consisting of ceramics was recovered from three contexts (**3001**, **3002** and **3006**) and unstratified material (**3000**), all from Trench 3.

The site assemblage was separated by context; all artefacts were then quantified by type, fabric, sherd/fragment count and weight, and recorded in a database.

See Appendix III for a detailed record of the material recovered from Trench 3 of the Hafod Excavation.

Analysis

A small selection of Post-medieval and modern pottery was recovered from the excavation of the approaches to the canal bridge at the entrance to the Hafod Copperworks, Swansea. The oldest pottery recovered from the site was a single small bodysherd of grey stoneware bottle or storage jar (weight: 16g) dating to the 19th century recovered from unstratified material (**3000**). A number of artefacts recovered from unstratified material are also represented in stratified contexts. The same glazed floor tiles recovered from context **3000** was also recovered from the earthen bank (**3001**) above the stone drain **3004**. These tiles had a deep red glaze and date to the 20th century. A modern, white glazed ceramic vessel recovered from unstratified material (**3000**) was also represented in contexts **3001** and **3002** (subsoil). These sherds come from large, flatware vessels with white internal and external glazes. It seems likely that these four sherds (**3000** – two sherds, **3001** – one sherd, **3002** – one sherd) originate from the same vessel. Slate roofing tiles were recovered from two contexts (**3001** and **3006**), two of these fragments carried evidence of bitumen waterproofing, suggesting that they roofed a 20th century building.

Conclusion

All of the material recovered from Trench 3 of the Hafod excavation is of modern or late-19th century date and is of limited archaeological interest.

6.6 Synthetic materials – Andy Sherman (GGAT)

A total of two fragments of modern veneer from Medium Density Fibreboard or a similar material was recovered from context **3002**. Neither of these fragments are archaeologically significant.

Context	Material type	Description	Quantity	Weight (kg)	Period
3002	Synthetic	Pieces of veneer from MDF or similar	2	0.002	Modern

6.7 Mortar and plaster - Rob Dunning (GGAT)

Introduction

A single sample of mortar (*01) was recovered from context **3004** and submitted for assessment. The samples were examined visually and described by colour and presence of inclusions. Hardness was tested by resistance to manual pressure:

Hardness	Description
Very hard	Impossible to break with manual pressure
Hard	Breaks with manual pressure
Soft	Breaks under light manual pressure
Very soft	Crumbles without additional pressure

Assessment

Site no.	Sample	Context	Description	Weight (g)
766	01	3004	Hard grey-white lime mortar, containing isolated coal and lime fragments (less than 1mm in diameter)	12.3

Conclusion

The sample is not suitable for chemical analysis, although the visual assessment suggests that it dates to the late Post-medieval period.

6.8 Finds retention

The glass battery rest insulator is the only object from the assemblage required to be retained for the archived assemblage. No further recommendations are required for the iron hammer unless the City and County of Swansea wish to retain it to be displayed, in which case it will require a minimal amount of conservation.

7 Discussion

In the early nineteenth century, Glamorgan was the world centre of two metal smelting industries: copper and iron, of which both used great rows of reverbatory furnaces and it is instructive to compare the differences between the two types of buildings. The Hafod was the largest copperworks in the world during most of the nineteenth century, but the world's largest ironworks was Cyfarthfa Ironworks in Merthyr Tydfil. The nature of the metals being processed holds the key to why the two groups of structures, one in Swansea, and one in Merthyr, were so different. The way the two different metals, copper and iron, were processed were different. The iron furnace method used the iron-ore, coal and limestone all charged together from the top of a tall furnace, so the taller the furnace, the larger the quantity of iron can be produced. In the copper smelting method in use in the 18th and 19th centuries, saw the introduction of the coal-fired reverbatory furnace. Reverbatory furnaces were long, low structures that kept the coal fuel and the metal being smelted separate and so the latter was free from any contamination by the fuel used. Heat from the coal in the sunken stoke-hole at one end of the furnace, was induced to pass over the copper-ore spread over the broad furnace bed by the up-draught created by exceptionally tall chimneys sited at the far end of the furnace structures (Hughes 2000, 19). The similarities between the two processes were their need for coal, and their need to dispose of slag waste.

The Merthyr works carpenter, Watkin George, discovered that cast iron could replace timber and stone in constructional work in a way that the relatively soft copper could not (Hughes, 2000). The Swansea copperworks, therefore, also reveal interesting information about contemporary ironworking in construction. The neighbouring Morfa Copperworks to the Hafod had an interesting use of structural ironwork which they utilised early on in comparison to the Hafod Works. The bridge that forms the entrance to the Morfa Copperworks across the Swansea Canal was built out of iron in 1840 and the name of the works cast-in, as well as designing the ventilated and open arcade design for the rolling mill in 1830, and the tall cast iron columns still seen in the 'canteen' or 'power house' built in the 1840s. The entrance bridge over the Swansea Canal to the Hafod Copperworks was constructed by stone. This does not mean that the Morfa works was more progressive than the Hafod. The stone-built canal bridge partially exposed during the Hafod Community Excavation was similar in style to many of the stone built bridges which crossed the Swansea Canal in the early 1800s, before the Morfa works was established. The reason for the Hafod Copperworks not updating their entrance bridge by using iron may simply have been because it was not needed. The excavation revealed that at some point, the pathway extending north from the bridge has been reconstructed possibly because the horse and cart became obsolete. All of the manufactured copper goods were transported by a team of horse drawn wagons along the canal to the docks (Plate 2), before the works railway was made. Trucks may then have been used to transport material through the main entrance. There may have been a reason why the northern pathway was demolished around this time, possibly to leave more room for buildings to be built up against the canal. Further excavation may help to answer these questions.

The Hafod entrance bridge contained a metal bar amongst the cobbles which may have been a catch bar to stop the horses slipping. The bridge also shows wear marks alongside some of the flagstones (see figure 3, Plate 10) where the carts have slipped. The amount of wear on the stones suggests an excessive amount of traffic carrying very heavy loads for the 100 years' worth of horse and cart use across the bridge.

This perhaps shows that the entrance to the Hafod works was for incoming traffic only and that before the trams used the northern entrance (seen on the first to fourth edition OS Maps), it was used as an exit for horse and carts. The width also shows that the bridge was for one-way traffic as there is no room for two carts to pass each other across the bridge. The second and third edition OS maps show another entrance to the Hafod Copperworks purely used for the tram network, which extends internally throughout the majority of the works. This may suggest that the horse and carts originally brought materials into the Hafod works through the main entrance, but once the railways could be utilised and the canals stopped functioning, then the main entrance was used for the workers access and exit to and from Trevivian (the Hafod workers housing area). Evidence of this was revealed in Trench 3 which showed that erosion (3012, Plate 9) on the north side of the cobbles (3003) confirms the mapping evidence that horse drawn carts were heavily used at the entrance of the copperworks.

Vivian slag coping stones are visible in parts of the Hafod entrance bridge in a photograph taken in 1931 (Plate 2). The photograph clearly shows a towpath underneath the bridge along with the cobbled path excavated during the Trench 3 excavation aligned north-south. The photograph also shows the use of pointed copper-slag blocks capping the bridge. Similar pointed copper-slag blocks were also seen during survey work done by the volunteers along the canal wall (Plate 14).

An image from Copperopolis (page 97, Fig. 140, Hughes, 2000), shows the entrance of the Hafod Copperworks in 1881. It depicts the Swansea Canal passing the south end of the Hafod Copperworks, the canal bridge and sloping pathway. It is not clear if the copper-slag blocks are being used at this point, although it is likely as the date of using copper-slag blocks by the Vivien's goes back to the early 1800s, although exactly when is unknown. The most impressive surviving use of this building material in Swansea is in the huge abutment that survives on the western side of the Swansea Canal outside of the Hafod Copperworks.

8 Statement of potential

The Hafod Copperworks is a key industrial site in South Wales. It was established in 1809 by John Vivian, nearly 100 years later than the Landore Copperworks which was built in 1717 and was the first Copperworks in Swansea. Shortly after the Hafod works was established, the Morfa Copperworks was opened in direct competition with the Hafod works from 1828.

However, at its peak in the mid-19th century the Hafod Copperworks was the largest in the world, with the greatest output. Morfa followed closely behind and between them, the thirteen copperworks in the Lower Swansea Valley accounted for 90% of the world's copper production (Hughes and Reynolds 1989, 11).

Together the eleven Listed Buildings, single Scheduled Ancient Monument and numerous unprotected standing remains form one of the few surviving groups of 19th century industrial buildings in Swansea. Together with the domestic housing built for the works staff and the transportation network constructed around the industrial plant, the site continues to influence the built environment of the city.

While the community excavation was limited in nature due to the industrial contamination of Trenches 1 and 2, the current work goes some way towards explaining the transportation network associated with the Hafod Copperworks and provides valuable insight into what can be achieved in the future.

8.1 Recommendations for further work.

If additional funding can be secured it is hoped that further archaeological work can be carried out to answer questions relating to the Hafod and Morfa Copperworks. These questions include the conditions of the survival of below ground archaeology relating to the flying tramway, which was originally investigated in Trench 2, but was abandoned because of contamination. It is hoped that we can find out about the survival and evolution of the north dock of the Swansea Canal, the potential alterations to the approach of the Morfa Copperworks canal bridge and the reasons for the alterations. The conditions of the survival of below ground archaeology relating to the bridge to the entrance of the Hafod Copperworks also require further investigation. The iron hammer requires conservation in order to enable its future display, and our results are to be published in an appropriate archaeological journal. In addition, it is recommended that further research goes into the bridges over the Swansea Canal. A Royal Commission survey from 1975 should provide valuable information, and therefore a visit to the National Museum of Wales is needed to view to survey.

9 Proposed post-excavation programme

The objectives of the post-excavation programme, in accordance with English Heritage guidelines (1991, 1996), will be to compile a research archive of the individual sites based on the industrial phase periods, a site narrative, full artefactual and residue reports, archive illustrations, combined with relevant literature-based research to form a full archive/client report. The full structural report will form the basis of further publication documents.

The proposed programme will be set out in a detailed post-excavation research design (PERD):

Step 1: Preparation of project design

Step 2: Preparation of specialist reports and archive illustrations, including artefactual illustration

Step 3: Stratigraphic analysis, based on the industrial phase periods, and narrative

Step 4: Integration and synthesis of stratigraphic, artefactual and illustrative records into a full archive report

Step 5: Preparation of publication report text(s) and illustrations

Step 6: Archive deposition

10 Archive storage and curation

The site archive will be stored at the premises of the Glamorgan-Gwent Archaeological Trust Ltd and/or at the premises of the appointed external specialists until completion of all analyses.

A policy of retention and disposal for the finds assemblage will be agreed in consultation with finds specialists, conservators, the receiving museum, and the landowner. However, it is expected that all of the stratified finds of Post-medieval date will be retained.

The primary site archive will be deposited in the same receiving institution as the finds assemblage.

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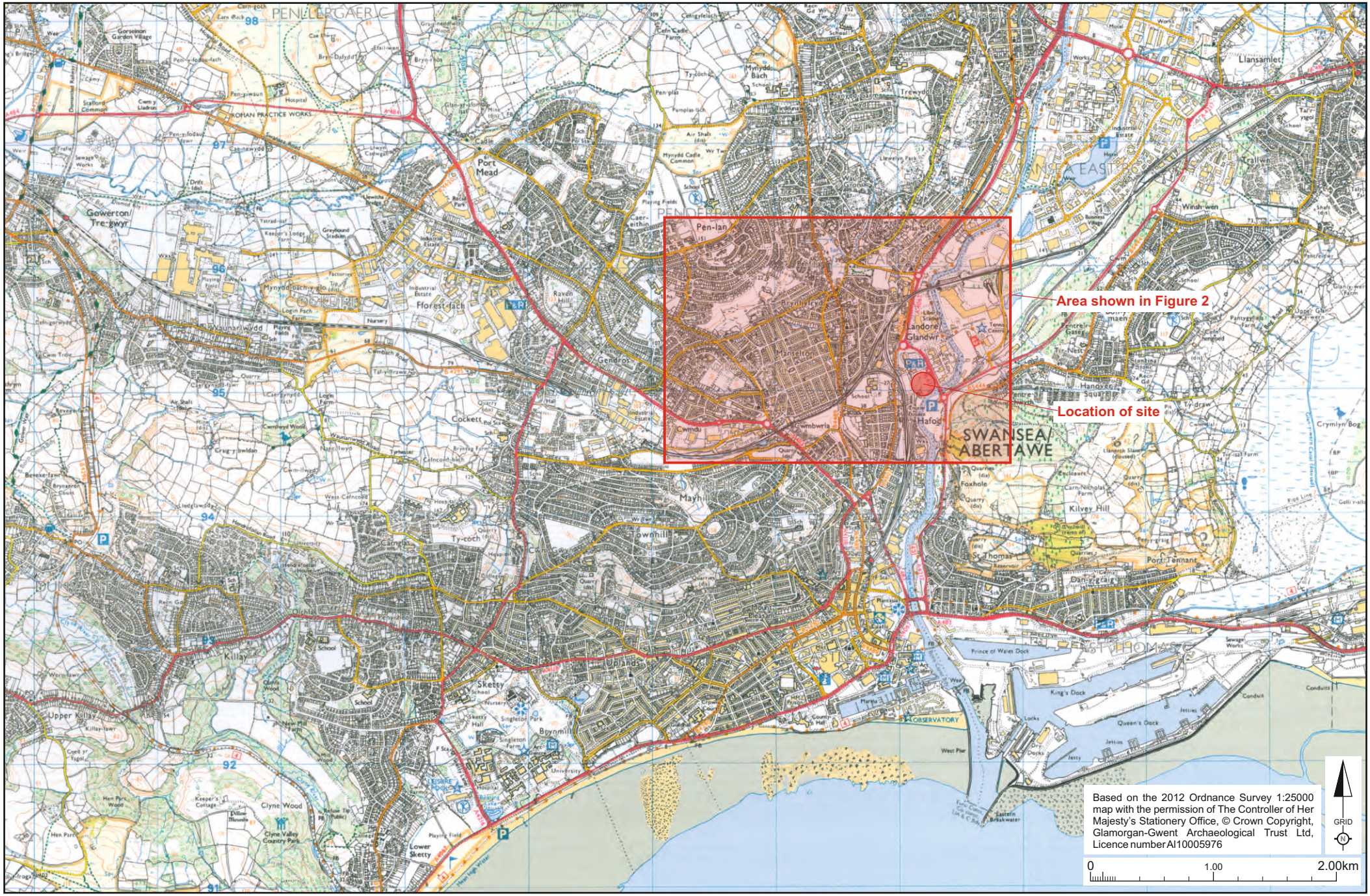
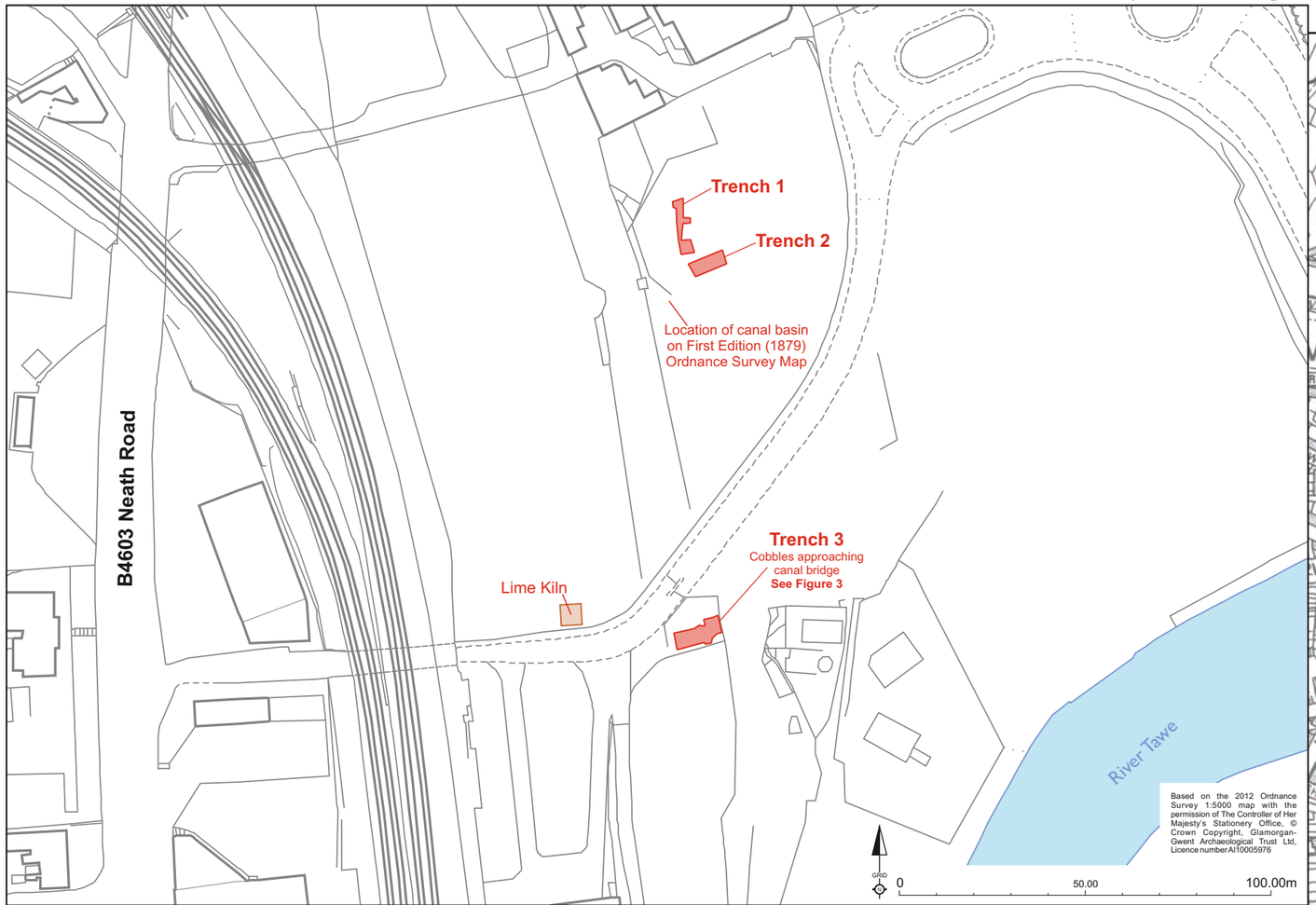
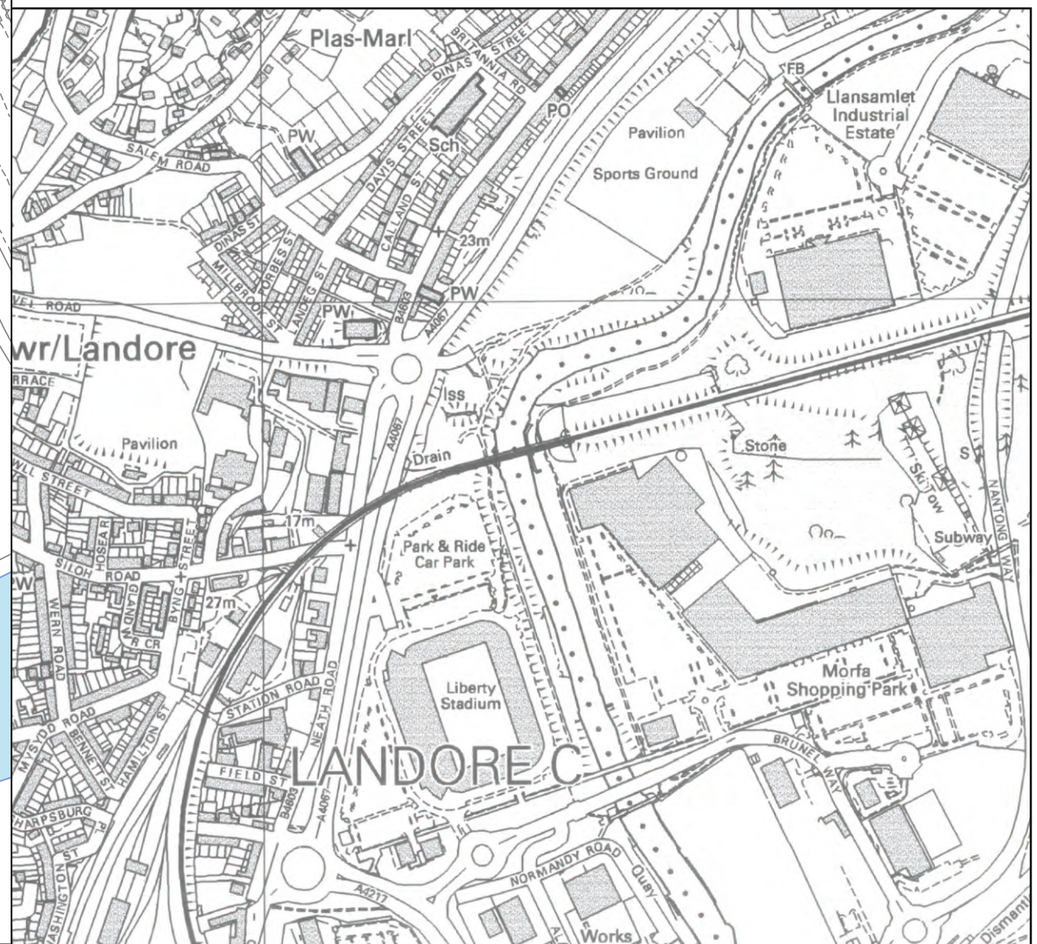


Figure 1. General area location and extent of map shown in Figure 2 (red)





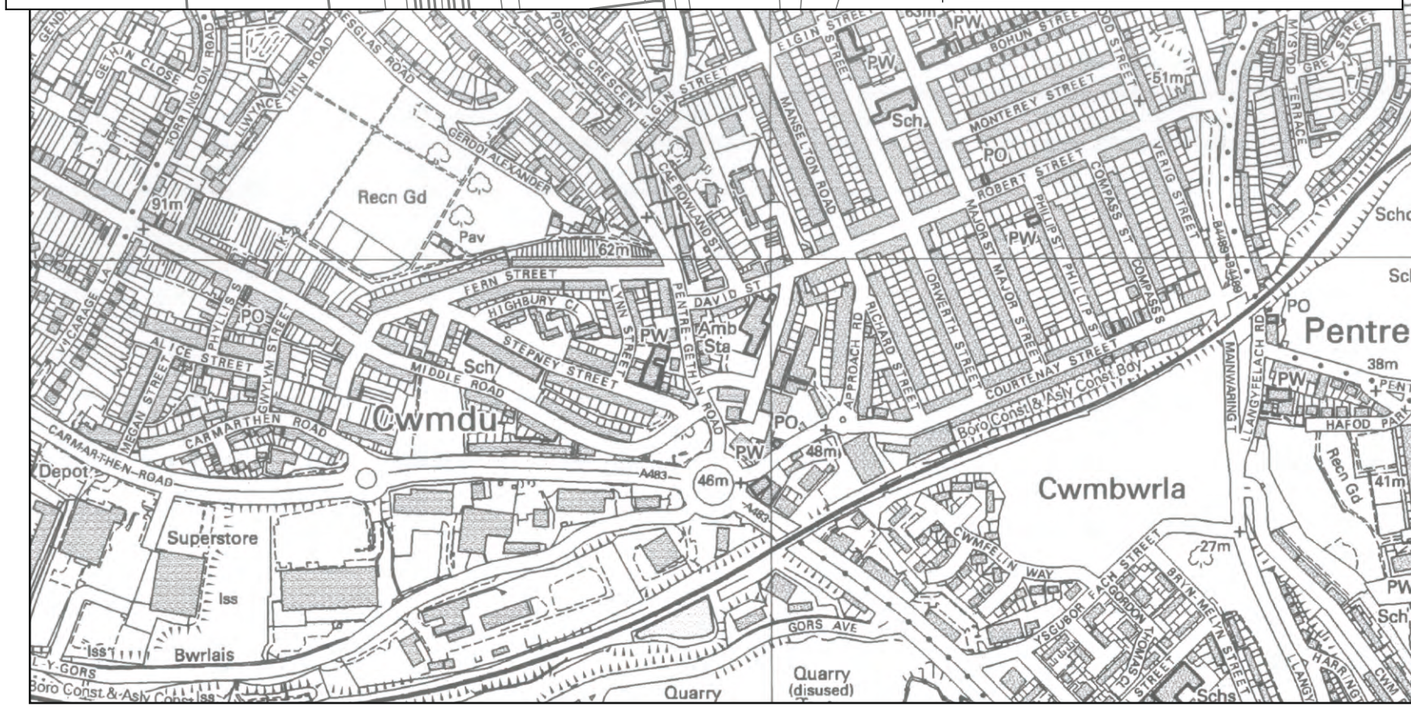


Figure 2. Plan showing significant archaeological structures and trench location (red)

Figure 3. Plan of Trench 3 with context numbers

Appendix I: Summary of the development of the Hafod and Morfa Copperworks (Locock 2002)

1798 Opening of Swansea Canal

1808 Construction of first canal dock on Hafod site

1809 Opening of Hafod Copperworks - John Vivian (smelting)

1814 Construction of steam powered rolling mill on HCW site

1819 Construction of second canal dock and Rolling Mill no. 1

1821 Construction of horizontal flue to stack "100 yards from the works on marsh" (Anon 1863)

1822 Addition of new furnace house

1826 'Chili house' smelting hall

1828 Morfa copper mills opens

1832 Construction of two stacks "at extremes of the site"

1833 Slag House furnaces

1835 Morfa works commences smelting

1840 Morfa buildings burnt down; Morfa rolling mill

1842 Hafod engine house (later re-used) and rolling mill no. 2

1846 Tithe map (not showing all of the buildings on the site)

1854 Simplified plan of Hafod ("Swansea Copperworks") in Tomlinson's *Cyclopedia*

1859 Blast furnaces

1865 Sulphuric acid chambers (chemical works); construction of west viaduct

1862 Engine house rebuilt

1879 Ordnance Survey map

1910 Engine house; works plans of Hafod Copperworks

1924 Hafod and Morfa Works amalgamated as British Copper; smelting ceases

1928, British Copper taken over by Imperial Chemical Industries; site operated as Yorkshire Imperial Metals

1980 Works close

Appendix II: Context index

Context number	Location	Type	Material/Description	Initials
1001	Trench 1	Deposit	Topsoil	JAC
1002	Trench 1	Deposit	Industrial waste deposit	JAC
1003	Trench 1	Deposit	Modern intrusion	JAC
1004	Trench 1	Deposit	Industrial deposit	JAC
1005	Trench 1	Structure	Concrete surface	JAC
1006	Trench 1	Structure	Concrete and stone structure	JAC
1007	Trench 1	Deposit	Modern brick deposit	JAC
1008	Trench 1	Structure	Cast iron drain and manhole cover	JAC
2001	Trench 2	Deposit	Topsoil	SL
2002	Trench 2	Deposit	Modern intrusion	SL
2003	Trench 2	Deposit	Black silty deposit	SL
2004	Trench 2	Deposit	Redepositted fragment of tarmac	SL
2005	Trench 2	Cut	Cut for modern intrusion (2002)	SL
2006	Trench 2	Deposit	Red gravel deposit	SL
3000	Trench 3	-	Unstratified finds	AS
3001	Trench 3	Deposit	Bank above (3004)	AS
3002	Trench 3	Deposit	Subsoil	AS
3003	Trench 3	Structure	East-west orientated cobbled surface	AS
3004	Trench 3	Structure	Northwest-southeast cobbled surface – Drain	AS
3005	Trench 3	-	Double number for (3029)	SL
3006	Trench 3	Deposit	Bank abutting wall [3024]	SL
3007	Trench 3	Deposit	Compacted stone surface to modern pathway	SL
3008	Trench 3	Deposit	Hard core foundation to (3007)	SL
3009	Trench 3	Deposit	Deposit of modern concrete	SL
3010	Trench 3	Deposit	Deposit of pink slag - ?Levelling layer	AS
3011	-	-	Not issued on site	AS
3012	Trench 3	Cut	Possible wheel ruts	AS
3013	Trench 3	Structure	Possible door aperture	AS
3014	Trench 3	Structure	Timber, possible remains of door	AS
3015	Trench 3	Structure	Stone drain to west of [3013]	AS
3016	Trench 3	Deposit	Compacted slag and pebble deposit to north of (3003)	AS
3017	Trench 3	Cut	U-shaped cu	AS
3018	Trench 3	Structure	Cobbled surface to south of (3003) - ?Ramp to canal towpath	AS
3019	Trench 3	Structure	Drain to south of (3003)	AS
3020	Trench 3	Structure	Probable bridge wall	AS
3021	Trench 3	Structure	Fe pipe	AS
3022	Trench 3	Deposit	Modern cable	AS
3023	Trench 3	Structure	Possible remains of disturb bridge	SC
3024	Trench 3	Structure	Stone built portion of north –south running wall, south of cobbles (3003) – Entrance to works	SC
3025	Trench 3	Deposit	Rubble overlying [3020]	SL

Context number	Location	Type	Material/Description	Initials
3026	Trench 3	Deposit	Red slag deposit – equivalent to (3020)	SL
3027	Trench 3	Structure	Cobbled surface to north of (3003) - ?Ramp to canal towpath	SL
3028	Trench 3	Structure	North – south running wall - north of cobbles (3003) – External wall of building	CN
3029	Trench 3	Structure	North –south running wall, north of cobbles (3003) – Entrance to works	CN
3030	Trench 3	Fill	Fill of cut {3017}	AS
3031	Trench 3	Group	Group number for northern entrance wall comprising [3028] and [3029]	AS
3032	Trench 3	Group	Group number for southern entrance wall comprising [3024], [3033] and [3034]: LB16881	AS
3033	Trench 3	Structure	Vivian patent built portion of north – south running wall, south of cobbles (3003) – Entrance to works	AS
3034	Trench 3	Structure	Red-brick abutment built of north –south running wall, south of cobbles (3003) – Entrance to works	AS

Plates

Plate 2: Aerial photo of Hafod and Morfa Copperworks c.1920

Copyright: City & County of Swansea: Swansea Museum Collection'

Plate 3: The original entrance to Vivian's Works. Before the works railway was made, connecting to the G.W.R. sidings, all the manufactured copper goods were transported by a team of horse drawn wagons along the canal to the docks. This photograph is taken from a set of albums of the Vivian & Sons Works at Landore, Swansea. The photographs were taken by Colquhoun - Photographers, at the request of Captain Hugh Vivian. There is no date in the albums but other evidence suggests they were taken early in the 1920s. Hafod and Morfa Plant and Process album 2.

(Copyright: City & County of Swansea: Swansea Museum Collection.)

Plate 4: Entrance to the Hafod Copperworks c. 1980s

Plate 5: Concrete surface 1005, Trench 1. View to the west.

Plate 6: Concrete and stone structure 1006 and modern intrusion 1007, Trench 1. View to the west.

Plate 7: Trench 2 initial excavation. View to the west.

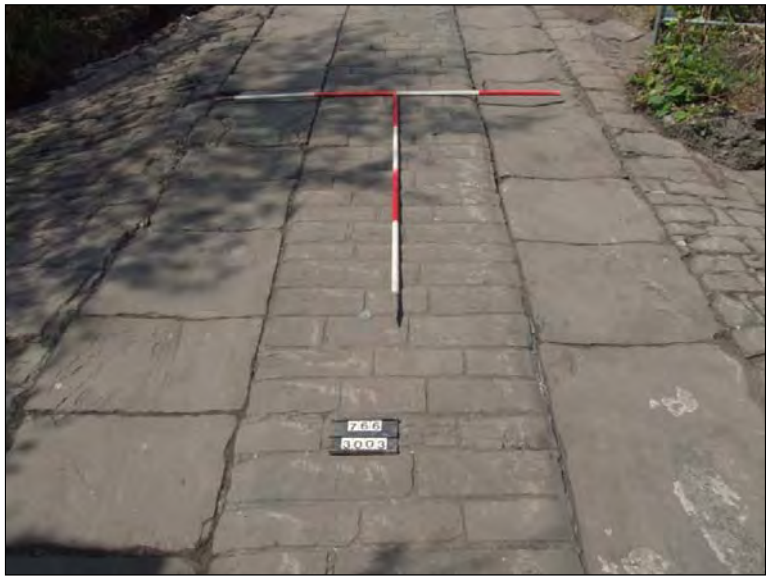


Plate 8: Bridge approach cobbles 3003, Trench 3. View to west.

Plate 9: Probable path to canal and towpath 3018, Trench 3. View to south.

Plate 10: Wagon erosion 3012 on north side of cobbles 3003, Trench 3. View to south.

Plate 11: Probable bridge wall 3020, Trench 3. View to the north.

Plate 12: In situ crucible, discover during walk-over of the line of Swansea Canal. View to the east.

Plate 13: Volunteers conducting a plane table survey of Trench 3. View to the east.

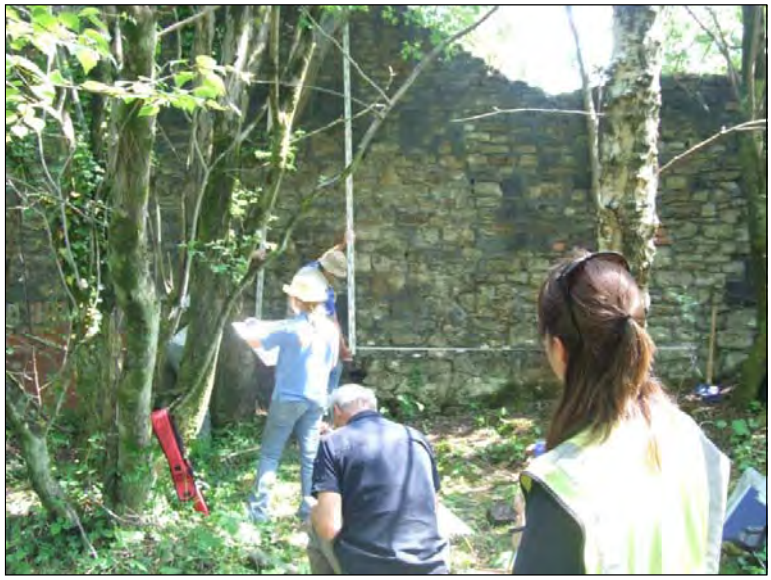


Plate 14: Volunteers practicing building recording on the standing remain of the canal wall. View to the south.

Plate 15: Pointed copper-slag blocks showing original height of the canal wall. A similar copper-slag block capped the bridge walls over the canal (see Plate 3).

Plate 16: Stitched image of the Canal wall.

Plate 17: Stitched image of the Canal wall buildings.

Appendix III: Post-medieval and modern ceramics

Context	Material type	Description	Quantity	Weight (kg)	Period
3000	CBM*	Ceramic roof tile	1	0.089	Modern
3000	CBM	Glazed floor tile	2	0.038	Modern
3000	Ceramic waste pipe	-	1	0.073	Modern
3000	Pottery	Modern ceramics with a hard white glaze. Sherds come from a large flatware vessel, glazed internally and externally – possibly with some industrial use.	2	0.298	Modern
3000	Pottery	White earthenware transfer-printed – includes sherd of plate base	3	0.010	19th century
3000	Pottery	Grey stoneware – body fragment of bottle or jar	1	0.016	19th century
3001	CBM	Glazed floor tile	1	0.021	Modern
3001	Pottery	Modern ceramics with a hard white glaze. Sherds come from a large flatware vessel, glazed internally and externally – possibly with some industrial use.	1	0.008	Modern
3002	Slate	Roofing tile with bitumen on upper surface	1	0.033	Modern
3002	Ceramic pipe	-	1	0.080	Modern

Context	Material type	Description	Quantity	Weight (kg)	Period
3002	Pottery	Modern ceramics with a hard white glaze. Sherds come from a large flatware vessel, glazed internally and externally – possibly with some industrial use.	1	0.144	Modern
3006	Slate	Roofing slate, one has traces of bitumen	3	0.283	Modern
3006	Ceramic pipe	-	2	0.185	Modern

*CBM = Ceramic building material

Appendix IV: Visitor and Volunteer Feedback

The attendance during the extent of the Hafod Community Excavation is as follows:

Date	No. of staff	No. of volunteers	No. of children
Wednesday 29th May	5 staff		
Thursday 30th May	4 staff	15 volunteers	
Friday 31st May	5 staff	20 volunteers	
Saturday 1st June	7 staff	17 volunteers	
Monday 3rd June	4 staff		
Tuesday 4th June	4 staff		
Wednesday 5th June	5 staff	13 volunteers	28 pupils and 5 staff (Hafod primary school)
Thursday 6th June	5 staff	15 volunteers	68 pupils and 10 staff (Burlais primary school)
Friday 7th June	5 staff	14 volunteers	
Saturday 8th June (open day)			10 YAC members plus 7 adults
Monday 10th June	4 staff	12 volunteers	
Tuesday 11th June	5 staff		

Total 70 staff days 111 volunteer days, 106 children and 22 accompanying adults.

In total, 51 people registered to take part in the event. Of these 11 did not attend, leaving 40 people who attended for a minimum of 1 day. Many volunteers attended for more than one day, with the average being 2.77 days per person. The most volunteers on site on any given day was 20.

Volunteer feedback

Feedback was requested from those who attended as volunteers. Two questionnaires were set up and all the volunteers who had attended were invited to respond. In each case there were 14 responses. This is disappointing as only 35% of those who volunteered gave their time responded to the surveys.

The first survey was about the volunteer experience of taking part in the community event. The most recent response was January 2014.

Most of those who responded (55.6 %) found out about the event by direct email from Glamorgan Gwent Archaeological Trust, 22.2 % from Cu @ Swansea meetings, 11.1% from the local press and 11.1% from Glamorgan Gwent Archaeological Trust social media.

The clarity of information available prior to registration was rated excellent by 31%, good by 62% and neither good nor poor by 8%. There were no “poor” ratings.

Of the responses, 70% stated that the information prior to booking did not influence their decision to enrol; 62% found the registration process “extremely” easy, 31% “quite” easy and 8% “moderately” easy.

The information available once registered was rated very useful by 25%, useful by 67%. One respondent (8.33%) stated that their registration got lost. This was not flagged up to the volunteer co-ordinator at the time of registration or during the dig.

The quality of the training received from the professional archaeologists was rated as excellent by 58% of respondents, good by 25% and adequate by 17%.

The volunteering experience was rated excellent by 69% of respondents, good by 15% and average by 15%. Of the respondents, 100% would volunteer if a similar event was put on at the Copperworks in future, and 100% would recommend it to a friend.

When asked to suggest further activities at the site, the only concrete suggestions were a litter pick and vegetation clearance. One respondent observed that there is no shortage of volunteer labour if the funding for professional archaeological support can be found.

The second questionnaire explored the legacy of the project from the point of view of volunteers continuing to engage with the site and their changing attitude to the copper industry in Swansea as a result of taking part in the community excavation.

Of the respondents, 100% answered that taking part in the project was a positive experience for them. Selections of their comments are as follows:

- ‘It brought it to life as it were, 'walking in the worker's footsteps''.
- ‘Pleased to be able to be part of saving what little is left of Swansea's industrial heritage’.
- ‘Enjoyable, informative, meet new people’.
- ‘….. I learnt a lot about what a dig involves - all that graph paper was unexpected, though I particularly enjoyed the recording processes’.
- ‘It helps you discover the past.’
- ‘It helped me develop my photography and social skills’.
- ‘It's an opportunity to do something I enjoy, in the open air, and to meet people with similar interests. I also feel it is of benefit to Swansea in an area where funding is likely to be sparse in the current financial climate.’
- ‘I was able to explore the area more closely and with greater knowledge’.
- ‘The weather was brilliant, making it a very pleasant outdoor activity. The dig had specific locations and purpose, spoiled only by the 'Health and Safety' delays when finding bits of sheet asbestos, (not unusual under the circumstances as it was a major building material of the day!). Enjoyed learning how and doing the drawings and plane table plans’.

- ‘I always saw the site as 'somewhat derelict and in need of modernization'. Since taking part in the dig I now see it as an area of preservation and further examination’.

Respondents were asked to rate the activities they participated in for enjoyment. The most popular activity was excavation, followed by drawn recording (although this was the only activity rated least favourite by one respondent). Level surveying was rated equal third with plane table surveying. Photography, which was specific task for some volunteers, was rated well by those who did it. Finds washing was rated well by those who did it, although this activity was restricted to those unable to engage with more physical tasks. One participant commented that all the skill areas were new and that it was fun.

Most respondents’ reasons for joining the project were because of an interest in their locality, heritage or archaeology. Some participated in order to improve their skills in either archaeology or photography. One cited local connections and family connections to the copperworks. Although some people had found out about the project from the Connected Communities initiative, nobody stated that they were active in other groups linked to Connected Communities in Swansea. The anecdotal evidence from other volunteers, who possibly did not respond to the survey, is that they do have these connections.

In total, 46% of the respondents attended the open day that took place during the excavation. 31% have visited the site since the event ended, and 54% have either taken other people to the site or have recommended that others visit it. Of the respondents, 75% stated that taking part in the event had changed their thinking about the copper industry in Swansea, stating:

- ‘I didn't realise the impact it had on Swansea and the connections with the wider world’.
- ‘I was interested before, so this is not a negative answer! Generally I'd say there is a lack of readily available information about Swansea's industrial past’.
- ‘Since the industry was relatively recent, I was surprised how few historical technical drawings were available of the site development and locations of points of interest’.
- ‘I have since read many articles in relation to the site and although I have had great pleasure on this topic I feel that my interests may concentrate on other aspects of local history’.
- ‘It brought my knowledge and historical interest more to the front’.
- ‘It made me aware of scale of industry and how much of the infrastructure has been lost’.
- ‘I had little information on the copper industry and history of the area before starting the project’.
- ‘It brought the history to life more’.

The final question in the survey asked what people thought should happen to the site in the next 10 years. A selection of comments is reproduced below.

- 'I think that it should be conserved as much as possible and I would like to see more people visiting the area'.
- 'At the moment there is a lot of waste land there which could be used to the benefit of the current Swansea. It is therefore important to get as much of it recorded as possible before release for other use. It would be good if some of the buildings can be saved and put to future use. However it is important that the future use of the buildings/site is sustainable in the long term - it would be pointless spending lots of money for the buildings to stand unused and deteriorate again (as has happened elsewhere)'.
- 'More exploration, restoration and guided tours'.
- 'The site lends itself to development into a Swansea History Museum site. The costs of restoration would probably be prohibitive, so in the current economic climate would only happen using organised volunteer labour and private funding'.
- 'Further excavation on a much larger scale (although financial restraints will be the biggest issue). Making this area a strong link with the marina and making it a safe environment for families to walk and enjoy. Restaurants, cafes etc. built with the existing 'Copper Quarter' surroundings very much in mind'.
- 'I would like to see the buildings and where possible different sites preserved and opened to the public'.
- 'Repair/salvage as many buildings as financially possible. A completed project showing industrial history with buildings and machinery. Landscaping with trails and picnic/seating areas'.
- 'Over the last years the image of Swansea has changed a great deal. Money has been spent to improve the city, to present it as a modern, glossy, go ahead city, good for modern business. Now it is time to create a Swansea version of The Black Country Museum/Beamish Museum/Blists Hill. It would cost a great deal of money but would be money well spent. Preserve what is left as a living museum. Is there the will to do.....I doubt it.....But it should be done before the whole lot disappears. Such history as there is in the copperworks areas of Swansea would create new jobs and would bring in visitors. Something brilliant could be done AS HAS BEEN DONE IN OTHER PARTS OF THE COUNTRY but please not like St Fagan's'.
- 'A use to be found for some of the buildings before they are restored. Use of the river for recreation to be explored. Need to build a hotel in the area to encourage visitors to the liberty Stadium'.
- '…development of the area for tourist and business'.
- 'I'm hoping the current plans for various ways of giving information to people will materialise, especially the gates. And then be well looked after. Then for funding to be raised to preserve the buildings and for community organisations to be using them regularly, so that it's a living space as well as a special historical place'.

- 'Further community excavations to discover more about this topic'.
- '…I would like to see the buildings and machinery restored with up to date working equipment and technology that represents the former industrial area. Realistically, I would like to see a visitor centre and working grounds'.

GGAT would like to thank all the volunteers who gave their time at the community excavation, and to those who completed the surveys. The feedback from these surveys will inform both GGAT when designing community events in the future, and the funding bodies and organisations involved in the wider project when making decisions about the future of the Hafod/Morfa Copperworks site.

Glamorgan-Gwent Archaeological Trust Ltd (Projects Division)

QUALITY CONTROL

Report Title: Hafod Community Excavation Report
Report Date: June 2014
Report Number: 2014/018

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As part of our desire to provide a quality service we would welcome any comments you may wish to make on the content or presentation of this report.

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