

Refurbishment of the Powerhouse, Hafod-Morfa Copperworks

Site Investigation (SI) Works Archaeological Watching Brief Report



**Prepared for
City and County of Swansea**

By



**- BLACK MOUNTAINS ARCHAEOLOGY -
- ARCHAEOLEG MYNYDD DU -**

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Summary

Comisiynwyd Archeoleog Mynydd Du Cyf gan y Ddinas a'r Sir o Abertawe i gwblhau briff gwyllo archeolegol yn ystod ymchwiliad daear gan Hydrock o ardal ddifaith rhwng adeiladau'r Pwerdy (LB11691) a'r Melin Rolio (LB16878) ar yr hen safle'r Gweithdy Copr Hafod-Morfa (Ffigur 1).

Mae'r datblygiad arfaethedig yn cynnwys yr adnewyddiad llawn o'r Pwerdy (LB11691) Gradd II rhestredig presennol i greu distyllfa newydd wedi'i chysychtu gyda rhodfa dan do newydd i adeilad ganolfan ymwelwyr arfaethedig a siop gasgen wedi'i fondio arfaethedig tu mewn Gradd II rhestredig Melin Rolio (Storfa Amgueddfa LB16878); gwaith tirlunion a gwaith i'r Landore Park presennol a Ride Car Park i ddarparu 60 lle parcio wedi'i ddyrannu a gwaith daear cysylltiedig arall (2018/0836/FUL and 2018/0837/LBC).

Cloddiwyd cyfanswm o ddeg pwell arbrawf gan peiriant ac yna cawsant eu glanhau gan llaw a recordio. Nodwyd llawr wedi'i wneud of teils chwarel yn ymwneud â'r 'Ystafell Gotio a Baddonau' o'r 1920au ar yr 1939 cynllun ICI (Ffigur 3), a ddarganfyddwyd bod hyn wedi goroesi ar draws pob un o'r tri phwell arbrawf (PA 1, 2, 4) tu mewn yr ardal gaeedig wrth wal y gwrthglawdd. O dan y llawr hyn dadorchuddiwyd strwythur maen arwyddocaol wedi'i adeiladu o dywodfaen a wedi'i bondio â morter calch, wedi'i goroesi ar draws pob un o'r phwell arbrawf. Credir fod y strwythur yn ymwneud â'r adeilad cynharach a gofnodwyd ar yr argraffiad cyntaf o'r Map arolwg ordnans (1879 Ffigur 2). Roedd PA11 wedi'i leoli ar y tu allan i'r ôl troed yr adeilad 'Ystafell Gotio a Baddonau'. Darganfyddwyd olion wal a llawr brics wedi'i alinio G/D y ogystal a gwaddodion slag cywasg cyfoethog a all gynrychioli'r llawr neu sylfaen y castdy estynedig a ddangosir ar Gynllun ICI 1939.

Yn PA 13 & 14 gerllaw swyddfa'r bont bwysu dadorchuddiwyd waliau gogleddol, dwyreinol a gorllewinol o'r bont bwysu wedi'i farcio cyntaf ar y Map arolwg ordnans 1953 (1:1,250 Ffigur 5). Yn Pwell arbrawf 13, datgelodd wal maen wedi'i alinio i'r dwyrain/gorllewin yn cynrychioli'r parhad y wal gwrthglawdd gogleddol allai fod y wal ogleddol bosib y basn camlas, fel nodir ar yr Argraffiad Cyntaf o'r Map arolwg ordnans (1879 Ffigur 2). Yn Pwell arbrawf 15, datgelodd wal maen pellach wedi'i alinio dwyrain/gorllewin sy'n ymddangos i i cynrychioli'r parhad o'r wal gwrthglawdd deheuol. Yn Pwell arbrawf 16, datgelodd sylfeini y wal dwyreiniol y Porthdy Porthor, a hynny'n darganfywud i eistedd ar wal frics gynharach oedd yn cynnwys cornel gron a all gynrychioli'r fynedfa i basn y gamlas hanesyddol (Ffigur 2). Nid oedd unrhyw nodweddion archeolegol arwyddocaol a ddarganfyddwyd yn Pwell arbrawf 12, a oedd wedi'i leoli ar hyd wal ogleddol y swyddfa'r bont bwysu.

Cloddiwyd cyfanswm o ddwy dwll turio gan llaw i ddyfnder o 1m wedi dilyn gyda drilio i ddyfnder o 5m a drilio cebl i ddyfnder o 20m. Roedd log twll turio wedi cofnodi natur a dyfnder y gwaddodion. Ni chafodd unrhyw nodweddion archeolegol arwyddocaol eu ddarganfod yn Twll Turio 1. Yn Twll Turio 2 dadorchuddiwyd y wal ddeheuol o'r pont pwysu. Ail-leolwyd lleoliad y dril i osgoi y nodwedd hyn. Nodwyd dyfnder llawr y basn camlas i bod yn 3m o dan wyneb y ddaear bresennol.

Mae'r adroddiad presennol yn nodi canlyniadau'r briff gwyllo archeolegol, a hynny'n unol â Safon Sefydliad Siartredig Archeolegwyr a chanllawiau ar gyfer briff gwyllo archeolegol. Cyhoeddwyd 2014.

Black Mountains Archaeology Ltd/ Archaeoleg Mynydd Du Cyf have been commissioned by the City & County of Swansea to carry out an archaeological watching brief during ground investigation works by Hydrock of a derelict area in between the Powerhouse (LB11691) and Rolling Mill (LB16878) buildings on the former site of the Hafod-Morfa Copperworks (Figure 1).

The proposed development includes the full refurbishment of existing Grade II Listed Powerhouse (LB11691) to create a new distillery linked by a new covered walkway to a proposed visitor centre building and proposed bonded barrel store within part of the Grade II Listed Rolling Mill (Museum Stores LB16878); landscaping works and works to the existing Landore Park and Ride Car Park to provide 60 allocated parking spaces and other associated ground works (2018/0836/FUL and 2018/0837/LBC).

A total of ten test pits were machine excavated followed by hand cleaning and recording. A quarry tile floor relating to the 1920s 'Cloakroom and Baths' noted on the 1939 ICI plan (Figure 3) was discovered and found to survive across all three test pits (TPs 1, 2, 4) within the area enclosed by the revetment wall. Beneath this floor a substantial masonry structure constructed of limestone bonded with lime mortar was uncovered, surviving across the same three test pits. The structure is believed to relate to the earlier building recorded on the First Edition Ordnance Survey map (1879 Figure 2). TP11 was positioned outside the footprint of the 'Cloakroom & Baths' building. The remains of a N/S aligned wall and brick floor were discovered as well as compacted slag-rich deposits that may represent the floor or foundation of the extended cast house shown on the 1939 ICI Plan (Figure 3).

Test pits 13 and 14 adjacent to the weighbridge office uncovered the north, east and west walls of the weighbridge first marked on the 1953 Ordnance survey map (Figure 5). Test pit 13 also revealed an east/ west aligned masonry wall that represents the continuation of the north revetment wall, possibly the north wall of the canal basin, as marked on the First Edition Ordnance Survey map (1879 Figure 2). Test pit 15 revealed a further east/ west aligned masonry wall that appears to represent a continuation of the south revetment wall. Test Pit 16 uncovered the foundations of the east wall of the Porter's Lodge which was found to sit on an earlier brick wall that featured a rounded corner which may represent the entrance way to the historic canal basin (Figure 2). No significant archaeological features were discovered in Test Pit 12, which was located along the north wall of the weighbridge office.

A total of two boreholes were hand excavated to a depth of 1m followed by percussion drilling to a depth of 5m and cable drilling to a depth of 40m. A borehole log recording nature and depths of deposits was taken. No significant archaeological features were discovered in Borehole 1. In Borehole 2 the south wall of the weighbridge was uncovered. The position of the drill was repositioned to avoid this feature. The depth of the canal basin floor was noted at 3m below present ground surface.

The watching brief was undertaken to the professional standards of the Chartered Institute of Archaeologists 'Standard and Guidance for an Archaeological Watching Brief'. Published 2014.

1 Introduction

1.1 Project Background and Proposals

1.1.1 Black Mountains Archaeology Ltd/Archaeoleg Mynydd Du Cyf were commissioned by the City & County of Swansea to carry out an archaeological watching brief during ground investigation works by Hydrock of a derelict area in between the Powerhouse (LB11691) and Rolling Mill (LB16878) buildings on the former site of the Hafod-Morfa Copperworks (Figure 1).

1.1.2 The proposed development includes the full refurbishment of existing Grade II Listed Powerhouse (LB11691) to create a new distillery linked by a new covered walkway to a proposed visitor centre building and proposed bonded barrel store within part of the Grade II Listed Rolling Mill (Museum Stores LB16878); landscaping works and works to the existing Landore Park and Ride Car Park to provide 60 allocated parking spaces and other associated ground works (2018/0836/FUL and 2018/0837/LBC).

1.2 Objectives

1.2.1 The definition of an archaeological Watching Brief as set out by the *Chartered Institute for Archaeologists* (CIfA) is a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

1.2.2 The purpose of an archaeological watching brief (as defined CIfA 2014) is:

- to allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works.
- to provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.

1.2.3 A watching brief is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.

1.2.4 The objective of a watching brief is to establish and make available information about the archaeological resource existing on a site.

1.2.5 (*Chartered Institute for Archaeologists Standard and guidance for an archaeological watching brief. Published 2014*)

1.3 Legislative Framework

- 1.3.1 *Planning Policy Wales* (PPW 10th Edition) sets out the land use planning policies of the Welsh Government. Chapter 6 sets out the Welsh Government's policy towards the historic environment. It states "The historic environment of Wales is made up of individual historic features, archaeological sites, historic buildings and historic parks, gardens, townscapes and landscapes, collectively known as historic assets. The most important of these historic assets have statutory protection through scheduling, listing or designation as a conservation area. Other assets are included in formal registers, which identify them as being of special historic interest. Many others make a positive contribution to local character and sense of place. Some, such as buried archaeological remains, have still to be identified. It is important to protect what is significant about these assets and sustain their distinctiveness. Historic assets should be the subject of recording and investigation when they are affected by proposals that alter or destroy them. Historic assets are a non-renewable resource." (PPW 2018, 123-129).
- 1.3.2 Underpinning PPW are a series of legislative powers and TANs. *The Planning (Wales) Act 2015* sets out a series of legislative changes to deliver reform of the planning system in Wales, to ensure that it is fair, resilient and enables development. The 2015 Act also introduces a mandatory requirement to undertake pre-application consultation for certain types of development. The *Town and Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2016* defines in Schedule 4(l) the parameters and definitions for the requirement of pre-application consultation by Welsh Ministers, particularly in response to the effect of statutory designated monuments, buildings, and parks and gardens.
- 1.3.3 Advice on archaeology and buildings in the planning process was contained in *Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology and Welsh Office Circular 1/98 Planning and the Historic Environment*, which updated *Welsh Office Circular 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas* following the Shimizu (U.K.) Ltd. v. Westminster City Council Judgement (February 1997). Detailed advice on Environmental Impact Assessment is contained within *Welsh Office Circular 11/99 Environmental Impact Assessment*. Following adoption of the *TAN 24 Historic Environment* on 31st May 2017, *Welsh Office Circulars 60/96 Planning and the Historic Environment: Archaeology; 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas; and 1/98 Planning and the Historic Environment* have been cancelled.
- 1.3.4 Any works affecting an ancient monument and its setting are protected through implementation of the Ancient Monument and Archaeological Areas Act 1979. In Wales the 1979 Act has been strengthened by *The Historic Environment (Wales) Act 2016*. The 2016 Act makes important improvements for the protection and management of the Welsh historic environment. It also stands at the centre of an integrated package of secondary legislation (Annexes 1-6), new and updated planning policy and advice, and best-practice guidance on a wide range of topics (*TAN 24 Historic Environment*).

- 1.3.5 Taken together, these will support and promote the careful management of change in the historic environment in accordance with current conservation philosophy and practice.
- 1.3.6 The *Ancient Monument and Archaeological Areas Act 1979* and *The Historic Environment (Wales) Act 2016* sets out a presumption in favour of preservation *in-situ* concerning sites and monuments of national importance (scheduled/listed), and there exists in the current *Planning Policy Wales (Chapter 6)* a presumption in favour of preservation *in-situ* of all types of heritage assets.

1.4 Location, Topography and Geology

- 1.4.1 The former Hafod-Morfa Copperworks (NGR SS(2)66250, (1)95020) is located approximately 4km north of the city centre on the banks of the River Tawe. Swansea is situated on Carboniferous Coal measures and the extraction of coal from this area has greatly influenced the history and development of the region. The soils over the study area are largely un-surveyed but are likely to include alluvium associated with the River Tawe and substantial peat deposits (SSEW 1983).
- 1.4.2 The geology generally comprises of 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 (West Phalian C). This sedimentary 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, clay and some bogs including alluvium. Superficial deposits within the development area are confined to clay, silt, sand and gravel, which would have been deposited in the Quaternary Period approximately 2 million years ago (BGS Sheet 247).

1.5 Archaeological and Historical Background

- 1.5.1 During the mid-19th Century the Hafod-Morfa Copperworks were the largest copperworks in the world employing over 1000 people. Situated in the Lower Swansea Valley, this area at that time accounted for 90% of the world's copper production (Hughes 2000). This was made possible by the plentiful supply of coal in the Swansea Valley, brought down via the late 18th century canals, and the excellent facilities for shipping, which allowed the import of copper ore from Cornwall, North Wales, South America and Australia. The Hafod Copperworks was established in 1808-9 by the Cornish entrepreneur John Vivian. In 1835 a Cornish firm, Williams, Foster & Co. opened the Morfa Works on adjacent land. The works was initially a rolling plant for making bars and plates from copper ingots brought from the nearby Rose Works but smelting is believed to have started at the same time. Both the Hafod and Morfa works amalgamated in 1924 and was subsequently operated by Yorkshire Imperial Metals until it closed in 1980, when it was the last operating copperworks in Swansea (Hughes 1989, 2002).

- 1.5.2 At least 15 or more significant structures, in varying degrees of condition, survive across the Hafod-Morfa site. These include the rolling mill (LB 16878) now used as museum stores, the laboratory building (LB 11690) and the former Morfa Powerhouse and later Yorkshire Imperial Metals canteen (LB 11691). The Hafod Limekiln (LB 11694), Copper slag Abutment, Pier and Canal Boundary Walls (LB 11692 and 11693). The Vivian Engine House (LB 11695), the Chimney (LB 11696) west of the Vivian Engine House and the Boundary Wall for the Hafod Morfa Copperworks Canal Docks (LB 16881). Finally, the *in-situ* Musgrave Engine and Rolls (SAMGm483) in the Musgrave Engine House and Chimney (LB 11697).
- 1.5.3 The history of the Hafod-Morfa Copperworks is reasonably well understood, although many gaps in knowledge do exist pertaining to the function and layout of the individual buildings on site. Useful resources include ‘Copperopolis’, Stephen Hughes’ (2000) outstanding work on the copper industry in Swansea (and beyond) and for the Hafod-Morfa Copperworks, Dyfed Archaeological Trust’s Appraisal ‘The Yorkshire Imperial Metals Site’ (2002) is particularly helpful in understanding the archaeological potential of the remaining historic assets on site.
- 1.5.4 They provide the following description for the Powerhouse building (LB11691) (2002, p37-39). “The canteen is a rectangular, free-standing masonry building aligned east-west, measuring 30m by 18m. It was built in the 1890s as an electric power house for Morfa Works, after H. R. Merton & Co. had taken a controlling interest in the firm in 1888; nevertheless, often referred to as Foster’s Power House. It is first shown on the OS 1:2500 map of 1899. It was converted into a works canteen during the 1920s-30s. It burnt down in the late 1970s, was restored and burnt down again in the 1980s. It is now derelict and roofless. The building is coterminous with, and was constructed over, a sub-rectangular pond, of unknown function. The pond is shown as a wet feature on the tithe map of 1844, Railway Deposited Plans of the 1850s-70s (WGRO P/60/CW/200) and the OS 1:2500 map of 1879. The pond is depicted as under separate ownership from the rest of the Morfa site. A small building is depicted at either end of the pond but the present Canteen building does not appear to incorporate any of their fabric”.
- 1.5.5 A hand drawn ICI plan (Plate 31) held by C&CS from between 1926 and 1951 helpfully labels all of the buildings that survive in the first half of the 20th century on the site. The Powerhouse is labelled ‘Canteen’ and is located adjacent to the Power House and Boilers to the south. To the north the cast house for the yellow Metals Mills is clearly visible as is several small buildings (stores?) to the rear (west) together with tramroads and a path to the weigh bridge and Silverstack Chimney. The cast house is also visible in the background of an undated photograph of the Silverstack Chimney (Plate 32).

1.6 Previous Investigations

- 1.6.1 Previous investigations of the Hafod Copperworks site and the wider area have already been noted in the recent 'Cultural Heritage Desk Based Assessment for Hafod-Morfa Copperworks, Neath Road, Swansea, Wales' (Morgan 2018) and do not need to be replicated here.
- 1.6.2 There have been no recorded archaeological excavations within the development area. A survey was recently undertaken of timber design patterns found discarded in the basement of the Powerhouse (Lewis and Cook forthcoming). The basement floor of the Powerhouse building was cleaned and a photogrammetric survey carried out of the timber design patterns stored there since the site was abandoned. The floor is composed of rectangular worn ceramic bricks, now uneven in places due to subsidence. It is possible that this is the remains of the floor of the pond noted above (1.5.4) or a later floor contemporaneous with the construction of the Powerhouse building but built over the back-filled pond, which may be causing the subsidence.
- 1.6.3 The development area has been studied as part of a number of wider desk-based assessments and appraisals that have assessed the potential for surviving archaeological deposits. The most recent desk-based assessment (*Morgan 2018*) identifies a number of 'destroyed' historic assets within the development area. Of particular interest is the 'Morfa Copperworks Building' (GGAT08244w), which is visible on the First Edition Ordnance Survey (1879) (Figure 2) as a NW/SE aligned structure with three railway tracks leading up to it. This building is replaced by a 'Cloakroom and Baths' as illustrated on a 1939 ICI site map (Figure 3; Plate 31). Also of note is the 'Morfa Copperworks Former Silverworks/Cast House (GGAT08242w), which was also aligned NW/SE along the length of the revetment wall within the development area and "is thought to have been established by 1840 as a silverworks. It was extended to the south between 1899 and 1919 and by 1943 a works plan has it labelled as a cast house" (Rubicon 2018, GGAT HER). Finally, the 'Copperworks Canal Basin' (GGAT08238w) is illustrated on early maps located just within the Morfa Entrance, but was infilled and replaced with the Weighbridge, Weighbridge Office and Porter's Lodge by 1939 (ICI Plan Figure 3).

2 Methodology

- 2.1.1 The archaeological watching brief observed the excavation of ten test pits and two boreholes (Figure 1). The excavation of the test pits was carried out using a single 6 tonne machine with 0.3m toothed bucket, 0.75m grading bucket and a concrete pecker when necessary. The excavation of the boreholes was carried out with a wrecking bar and shovel for the first metre, a percussive drill to a depth of five metres and a chain drill to a depth of 20m.
- 2.1.2 The archaeological recording techniques conformed to the best industry standard. All test pits were cleaned by hand. All archaeological deposits were recorded using a single context continuous numbering system and are summarised in Appendix III. All contexts were drawn in section at a scale of 1:10 and in plan at a scale of 1:20. All contexts were photographed in digital at 14mp with suitable scales. The investigations were tied to the Ordnance Survey National Grid and Datum using an EMLID Reach RS GNSS/Glonass (GPS) Receiver and data logger with a 10-20mm tolerance.
- 2.1.3 Asbestos laboratory testing of deposits from the development site were returned as positive, therefore, full PPE and RPE were worn during the works. Dust suppression was maintained using a power sprayer and a hand sprayer. All PPE and tools were cleaned or disposed of as contaminated waste.
- 2.1.4 Due to the levels of contamination on site at the Hafod-Morfa Copperworks no finds were removed from site. All classes of finds were recorded and catalogued and are summarised in Section 3.2.
- 2.1.5 The archaeological watching brief was carried out to the standards of the Chartered Institute for Archaeologists '*Standards and Guidance for an Archaeological Watching Brief*' (Published 2014).
- 2.1.6 With permission of the landowner the site archive will be deposited with Swansea Museum for permanent curation. A digital copy of the report and archive will be supplied to the regional HER, the LPA (CCS), the Royal Commission on the Ancient and Historical Monuments of Wales and CADW.

3 Results

3.1 Stratigraphical Evidence

- 3.1.1 The archaeological watching brief consisted of the excavation of ten test pits and two boreholes in accordance with the Method Statement provided by Hydrock.
- 3.1.2 The results of each test pit are detailed below and contextual information can be found in Appendix III.
- 3.1.3 Test Pit 1 (Figures 1-4, Plates 1-4)
- 3.1.4 Present ground surface 13.21m OD.
- 3.1.5 Test Pit 1 was positioned within the footprint of the proposed visitor centre. It was also positioned over buildings shown on historic mapping; a 'Cloakroom & Baths' marked on a 1939 ICI Plan (Figure 3) and an earlier building marked on the 1879 First Edition Ordnance Survey Map (Figure 2). The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.
- 3.1.6 The test pit measured 2.47m x 1.2m with a depth of 0.9m and was aligned SW/NE. The surface deposit was a dark grey brown demolition rubble (101) with a depth of 0.6m. It was a very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste.
- 3.1.7 The surface deposit (101) was removed to uncover a quarry tiled floor surface consisting of 15x15x2cm machine-made red quarry tiles [102] bedded on an 3-8cm thick concrete slab [103] of a 1920s/ 1930s date that we are confident relates to the 'Cloakrooms & Baths' building depicted on the 1939 ICI Plan (Figure 3). To the southern end of the test pit the quarry tile surface terminated at the base of what appears to be an NE/SW aligned red brick cavity wall or drain [106] with the remains of a brown ceramic 2" drain pipe *in-situ*. This may represent the external wall or, more likely, an internal division of the 'Cloakroom & Baths' building.
- 3.1.8 A section of the quarry tile floor was removed to reveal a 18-20cm layer of dark grey-black, coal dust-rich, loose silty loam (104) with very few inclusions apart from very occasional CBM flecks and fragments <5cm.
- 3.1.9 At the base of this deposit, at a depth of 0.9m, a substantial masonry structure [105] was uncovered extending across the whole test pit. Constructed of limestone rubble blocks of c. 10-25cm bonded in a white lime mortar with charcoal flecks that is mostly very compact with some soft and yellowed areas where water damage has occurred. The nature and size of this feature suggests a significant structure, probably related to the earlier building recorded on the First Edition Ordnance Survey map. The excavation was ceased pending full archaeological investigation and recording.
- 3.1.10 Test Pit 2 (Figures 1-3 & 5, Plates 5-7)
- 3.1.11 Present ground surface 13.14m OD.

- 3.1.12 Test Pit 2 was positioned within the footprint of the proposed visitor centre. Like the previous test pit, it was positioned over buildings shown on historic mapping; a 'Cloakroom & Baths' marked on a 1939 ICI Plan and an earlier building marked on the First Edition Ordnance Survey Map 1879. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.
- 3.1.13 The test pit measured 2m x 1.2m with a depth of 1.2m and was aligned NE/SW. Demolition rubble (201) had a depth of 60cm. It was a dark grey brown very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste. This was removed to reveal a quarry tiled floor surface consisting of 15x15x2cm machine-made red quarry tiles [202] bedded on a 17-20cm thick concrete slab [203], a continuation of the floor surface [102]/[103] uncovered in TP1.
- 3.1.14 A section of the quarry tile floor was removed to reveal a 30-38cm layer of dark grey-black, coal dust-rich, loose silty loam (204) with very few inclusions apart from very occasional CBM flecks and fragments <5cm.
- 3.1.15 Beneath this deposit, at a depth of 1.1m, a substantial masonry structure [205] was uncovered extending across the whole test pit. Constructed of limestone rubble blocks of c. 10-25cm bonded in a white lime mortar with charcoal flecks that is mostly very compact with some soft and yellowed areas where water damage has occurred. A continuation of masonry structure [105] discovered in TP1. The excavation was ceased pending full archaeological investigation and recording.
- 3.1.16 Test Pit 4 (Figures 1-3 & 6, Plates 8-10)
- 3.1.17 Present ground surface 13.18mOD.
- 3.1.18 Test Pit 4 was positioned in the centre of the footprint of the proposed visitor centre. Like the previous test pits, it was positioned over buildings shown on historic mapping; a 'Cloakroom & Baths' marked on a 1939 ICI Plan and an earlier building marked on the First Edition Ordnance Survey Map. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.
- 3.1.19 The test pit measured 2m x 0.9m with a depth of 0.95m and was aligned NE/SW. Demolition rubble (401) had a depth of 55cm. It was a dark grey brown very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste. This was removed to reveal a quarry tiled floor surface consisting of 15x15x2cm machine-made red quarry tiles [402] bedded on a 8cm thick concrete slab [403], a continuation of floor surface [102]/[103] uncovered in TP1 and [202]/[203] uncovered in TP2.
- 3.1.20 A section of the quarry tile floor was removed to reveal a 18cm layer of dark grey-black, coal dust-rich, loose silty loam (404) with very few inclusions apart from very occasional CBM flecks and fragments <5cm.

- 3.1.21 Beneath this deposit, at a depth of 83cm, a substantial masonry structure [405] was uncovered extending across the whole test pit. Constructed of limestone rubble blocks of c. 10-25cm bonded in a white lime mortar with charcoal flecks that is mostly very compact with some soft and yellowed areas where water damage has occurred. A continuation of masonry structures [105] discovered in TP1 and [205] discovered in TP2. The excavation was ceased pending full archaeological investigation and recording.
- 3.1.22 Test Pit 11 (Figures 1-3 & 7, Plates 11-15)
- 3.1.23 Present ground surface 12.84m OD
- 3.1.24 Test Pit 11 was positioned outside and to the east of the apparent footprint of the 'Cloakroom & Baths' building and the earlier NW/SE aligned building. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.
- 3.1.25 The test pit measured 3.5m x 1.2m with a depth of 1.50m and was aligned NE/SW. Demolition rubble (1101) had a depth of 90cm. It was a dark grey brown very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste. This was removed to uncover a concrete L-shaped section of pavement (1107) at the western end of the test pit at a depth of c.15cm, which was left *in-situ* and formed the western edge of the remaining test pit.
- 3.1.26 To the east of this, at a depth of 77cm, the base of a NW/SE aligned brick wall [1106] was uncovered. The wall, constructed of red un-frogged bricks was 28cm wide and crossed the width of the test pit. Wall [1106] was abutted on its west side by a brick-lined floor [1108] similar to that of the Powerhouse basement.
- 3.1.27 On the east side of NW/SE wall [1106] was a concrete slab [1102] with a depth of 17-20cm. A section of this slab was removed to reveal a 30-33cm deep deposit of dark-grey black, coal dust-rich loose silty loam (1103) that contained very few inclusions apart from occasional CBM and some cast copper waste.
- 3.1.28 At the base of this deposit, at a depth of 1.4m an unknown NW/SE aligned service pipe was uncovered, which appeared to be kerbed to the east with a concrete kerb [1105]. To the east of kerb [1105] a very hard and compact dark grey black metallised surface (1104) was uncovered that contained a high frequency of copper slag and copper waste fragments. An attempt to excavate a section of this deposit was abandoned at a depth of 12cm due to its compact nature and its high copper content. A cast copper cylindrical object (Plate 15) was recovered from the base of deposit (1103). ICI plans suggest that surface (1104) may sit within the footprint of the extended cast house, in which case it may relate to the floor or foundations.
- 3.1.29 Test Pit 12 (Figures 1-3 & 8, Plate 16)
- 3.1.30 Present ground surface 18.17m OD

- 3.1.31 Test Pit 12 was positioned adjacent the north wall of the weighbridge office. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.
- 3.1.32 The test pit measured 1.5m x 1m with a depth of c. 0.6m and was aligned NE/SW. The test pit revealed demolition rubble (1201), a loose dark grey brown silty loam containing fragments of brick and other waste material. Within (1201) contained an *in-situ* lead pipe servicing the weighbridge office building. Along the base of the weighbridge office wall was concrete slab (1202) with a thickness of c.20cm. Beneath this a brick foundation was uncovered with a depth of c.25cm consisting of three courses of red brick with no mortar. On reaching the lead pipe, excavation was ceased.
- 3.1.33 Test Pit 13 (Figures 1-3 & 9, Plates 17-19)
- 3.1.34 Present ground surface 18.07m OD
- 3.1.35 Test Pit 13 was located to the east of the weighbridge office in line with the north revetment wall. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.
- 3.1.36 The test pit measured 1.45m x 0.8m with a depth of 1.35m and was aligned NW/SE. Tarmac surface (1301) was removed to reveal a shallow 10-35cm layer of demolition rubble (1302) which consisted of a dark grey brown silty loam containing fragments and whole brick and other waste material. A NE/SW aligned pipe trench [1304] with a total depth of 0.75m was uncovered with a concrete (1308) and brick (1309) base, ceramic waste pipe and rubble and sand backfill material (1303). This trench cut into a further deposit of demolition material (1307) with the same make up as (1302). Rubble deposit (1307) continued to the base of the test pit and was not bottomed. To the south of the pipe trench an NE/SW aligned brick wall [1305] was uncovered, the top of which was at a depth of 55cm from the surface. The wall was constructed of red frogged bricks and concrete mortar and represents the north wall of the weighbridge. The test pit was excavated further to reveal eleven courses of brick. At a depth of 1.15m a timber beam (1310) was uncovered, in well-rotted condition, which was positioned NE/SW along the north facing elevation of brick wall [1305] and was found to be sitting on top of masonry wall [1306]. Masonry wall [1306] was aligned NE/SW in parallel to brick wall [1305] and appeared to be in line with the north revetment wall. Whilst it was not possible to gain access to masonry wall [1306] due to the depth of the feature and the instability of the test pit walls, it appeared to be constructed of limestone rubble with lime mortar. Excavation was ceased following the discovery of masonry wall [1306].
- 3.1.37 Test Pit 14 (Figures 1-3 & 10, Plates 20-25)
- 3.1.38 Present ground surface 18.07m OD.
- 3.1.39 Test Pit 14 was located to the east of the Weighbridge Office. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.

3.1.40 The test pit measured 4m x 0.8m with a total depth of 1.2m and was aligned NE/SW, extending from the east wall of the weighbridge office. Tarmac surface (1401) was removed to reveal demolition rubble (1402) which consisted of a dark grey brown silty loam containing bricks and other waste material. To the west of this, beneath the western edge of the tarmac surface and 1m from the weighbridge office wall, concrete kerbstone [1403] was uncovered. Kerbstone [1403] was aligned NW/SE in parallel with the weighbridge office building. Directly beneath kerbstone [1403] was NW/SE aligned brick wall [1404], which was constructed of frogged red bricks and cement mortar. A further concrete kerb [1405] was uncovered directly beneath tarmac (1401) at the eastern end of the test pit. This kerbstone was also found to sit on top of a NW/SE aligned red brick wall [1406] of the same construction. These walls represent the west and east walls of the weighbridge. The test pit was excavated between these walls to a depth of 1.2m and demolition rubble (1402) was found to be the only fill material and represents the event of backfilling the weighbridge. The deposit was not fully excavated. A number of un-frogged arch bricks were recovered from (1402) along with a length of large chain.

3.1.41 Test Pit 15 (Figures 1-3 & 11, Plates 26-29)

3.1.42 Present ground surface 18.07m OD.

3.1.43 Test Pit 15 was located to the east of the Porter's Lodge and Main Entrance. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.

3.1.44 The test pit measured 1.95 x 0.9m with a total depth of 0.85m and was aligned NW/SE. Tarmac surface (1501) was removed to reveal demolition rubble (1502) which consisted of a dark grey black silty loam containing bricks and other waste material. At a depth of 0.4m an NE/SW aligned masonry wall [1504] was uncovered that appeared to be in line with the south revetment wall. Whilst it was not possible to gain access to masonry wall [1504] due to the instability of the test pit walls, it appeared to be constructed of limestone rubble with lime mortar. To the south of wall [1504] at a depth of 0.7m a large NE/SW aligned metal pipe (1503) was discovered at which point excavation ceased.

3.1.45 Test Pit 16 (Figures 1-3 & 12, Plate 30)

3.1.46 Present ground surface 18.07m OD.

3.1.47 Test Pit 16 was located in the corner between the south wall of the Weighbridge Office and the east wall of the Porter's Lodge. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.

3.1.48 The test pit measured 2.3 x 1.3m with a total depth of 1.8m and was aligned NW/SE. Demolition rubble (1603) consisting of dark grey black silty loam containing bricks and other waste material was removed to a depth of 1.8m but was not bottomed. The excavation revealed the brick foundation of the east wall of the Porter's Lodge [1601] which consisted of three courses of yellow brown brick in english bond with lime mortar to a depth of 0.3m. Directly beneath foundation [1601] was an earlier phase of brick wall [1602] which continued to a depth of 1.6m. This wall was constructed of orangey red bricks in english bond with lime mortar and featured a wide, rounded return that curved to the west beneath the Porter's Lodge. Wall [1602] may be related to the west wall, and entranceway, of the historic canal basin marked on historic maps although further archaeological investigation would be required to confirm this.

3.1.49 Borehole 1

3.1.50 Borehole 1 was positioned in the south west corner of the Rolling Mill (Museum Collection) compound. It measured c. 25 x 25cm and had a total depth of 40m.

3.1.51 *1m depth hand dug section:*

3.1.52 Topsoil (011) with a depth of 25cm was removed to uncover a dark grey compact sandy loam demolition rubble (012) containing ash, fragments of stone and brick. This deposit had a depth of 40cm. At the base of rubble deposit (012) a ceramic service cover was uncovered. The service cover was found to be identical to other examples found on site so was not retained. The borehole was CAT scanned for live services. Beneath the ceramic service cover was a loose light orangey yellow sand (013) with a depth of 35cm, relating to an unknown service trench.

3.1.53 *1m-5m depth percussive drilled section:*

3.1.54 1-2m – Mid pinkish grey clay loam with few inclusions (014). Some 5-10cm rounded sandstone boulders. Occasional flecks of green copper and very occasional CBM. Occasional iron panning.

3.1.55 2.5-3.10m – Mid pinkish grey loam more clayey than above (015). Frequent sandstone boulders 5-15cm and smaller pebbles 2-5cm. Very occasional fleck of green copper. Bright orange deposits suggesting iron panning.

3.1.56 3.10-5m – Greyish yellow silty clay (016) with frequent 5-10cm rounded boulders and smaller 2-5cm pebbles. Frequent fragments of slag up to 15cm.

3.1.57 The remainder was drilled using a cable drill and a rotary open hole drill to a depth of 40m.

3.1.58 Borehole 2

3.1.59 Present ground surface 18.07m OD.

3.1.60 Borehole 2 was positioned in the centre of the upper weighbridge area to the north of the Morfa entrance. It is within the footprint of the former Morfa canal basin that was infilled in the 1920s prior to the construction of the Weighbridge and the Porter's Lodge. It measured c. 25 x 25cm and had a total depth of 42m.

3.1.61 *1m depth hand dug section:*

3.1.62 Modern tarmac layer (021) was removed to reveal a compact dark brown silty sand demolition rubble (022) containing fragments of brick and slag. This deposit had a depth of 2m. A red brick E/W aligned wall [023] was encountered within the north facing section of the borehole and continued to the base of the hand dug section. The position of the drill was adjusted to avoid this feature.

3.1.63 *1-11.3m depth percussive and cable drilled section:*

3.1.64 1-2m – Demolition rubble (022) as described above.

3.1.65 2-3m – Dark brownish-grey silty clay rubble (024) containing fragments of CBM, brick and slag.

3.1.66 3-4m – Dark bluish grey silty clay (025) containing significant amounts of coal dust and very small coal fragments. This deposit is similar to deposits uncovered in the Morfa canal bridge and represents the base of the clay-lined canal basin illustrated on historic mapping (Figure 2).

3.1.67 4-5.50m – Mid bluish grey silty clay (026) containing no archaeological inclusions. Some sub-angular and rounded sandstone inclusions ranging from c.10-30cm and becoming smaller and more gravelly towards base of deposit.

3.1.68 5.50-11.30m – Mid brown clayey silt (027) containing gravel and sandstone boulders. At the base of this deposit a large grey sandstone boulder was hit and drilling ceased.

3.1.69 The remainder was drilled using a rotary open hole drill to a depth of 42m.

3.2 Finds (Plates 11,16,24,25)

- 3.2.1 Very few finds were recovered during the watching brief. All material was processed and catalogued according to fabric type. All processing was carried out on site due to levels of contamination.
- 3.2.2 Two sherds of early 20th century white ceramic tableware were recovered from deposit (404) beneath the quarry tile floor in TP4. A cast copper cylindrical bar was recovered from deposit (1103) in TP11 along with a number of pieces of sheet copper waste.
- 3.2.3 A number of un-frogged arch bricks were retained from the weighbridge backfill material (1402) due to the possibility they may be a match for surviving canal structures. A large chain was also recorded from this deposit although it could not be removed as it appeared to be fixed at a lower depth.

Table 1. Finds Catalogue

Context	Material Type	Fabric type	Quantity	Period	Description
404	Pottery		2	20 th century	One base sherd of white glazed stoneware.
1103	Copper		1	19 th /20 th century	Cast copper cylindrical bar.
1402	Steel		1	20 th century	Large section of chain within backfill of weighbridge.
1402	CBM		6	19 th century	Un-frogged arch bricks. Retained as possibly related to, or match of, canal structures.
Key	Quantity in total number of sherds/fragments				

4 Conclusion

- 4.1.1 The archaeological watching brief uncovered significant archaeological remains in all four test pits. Test pits 1, 2 and 4 demonstrated uniform deposits across the area bounded by the revetment wall that is the proposed location of the new visitor centre. This included a quarry tile floor [102]/[202]/[402] relating to the 'Cloakroom & Baths' building marked on historic ICI plans of the site (Figure 3). The floor would appear to survive across the full footprint of the building, the dimensions of which are suggested by the red brick elevation that remains within the revetment wall.
- 4.1.2 The removal of the quarry tile floor in these three test pits revealed a substantial masonry structure [105]/[205]/[405] constructed of limestone rubble masonry bonded with white lime mortar. It is likely that this structure relates to the earlier building that is shown on historic mapping (1879 First Edition Ordnance Survey Figure 2) where it is depicted as a N/S aligned building with three railway tracks leading to it from the east. The location of this building adjacent to the old Morfa canal basin would suggest that the structure is related to the movement of cargo, almost certainly coal, from the canal to the copperworks.
- 4.1.3 In Test pit 11 the N/S aligned wall [1106] and brick-lined floor [1108] in particular have survived in relatively good condition. Their function is not currently understood but they may relate to the extended 'Cast House' marked on historic mapping (Figure 2). Certainly, the lower metal surface (1104) uncovered to the east of wall [1106] falls within the footprint of the extended 'Cast House' building and may relate to its floor surface or foundations.
- 4.1.4 Test pits 13 and 14 and Borehole 2 uncovered the four walls of the weighbridge which survive in good condition. The weighbridge was found to be backfilled with demolition material. Test pit 13 also uncovered a section of E/W aligned masonry wall at a depth of 1.15m below present ground surface that represents a survival of the early north revetment wall, possibly the north wall of the canal basin, as illustrated on historic mapping (Figure 2). Test pit 15 uncovered a further E/W aligned masonry wall that appears to align with the south revetment wall.
- 4.1.5 The large gauge ceramic pipe (1303) uncovered in Test Pit 13 is recorded on the 1951 ICI plan (Plate 31) where it can be seen to carry water from the canal to the Cast House and the wider Morfa site. The section cut through the pipe trench [1304] has demonstrated that the pipe post-dates the weighbridge and is therefore inserted after the 1930s. The metal pipe found in test pit 15 is of unknown date.
- 4.1.6 Test Pit 16 uncovered the foundations of the Porter's Lodge which was found to sit on top of an earlier brick wall, which may represent the west wall of the canal basin. A rounded corner feature of this earlier brick wall in the northern end of the test pit may represent the entranceway of the canal basin.
- 4.1.7 In Borehole 2 the basal deposits of the clay-lined canal basin was recorded at a depth of 3m below present ground surface.

- 4.1.8 The archaeological watching brief has demonstrated that significant archaeological features and deposits have survived in good condition beneath the present ground surface within the development area.

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6 Appendices

6.1 Appendix I: Figures

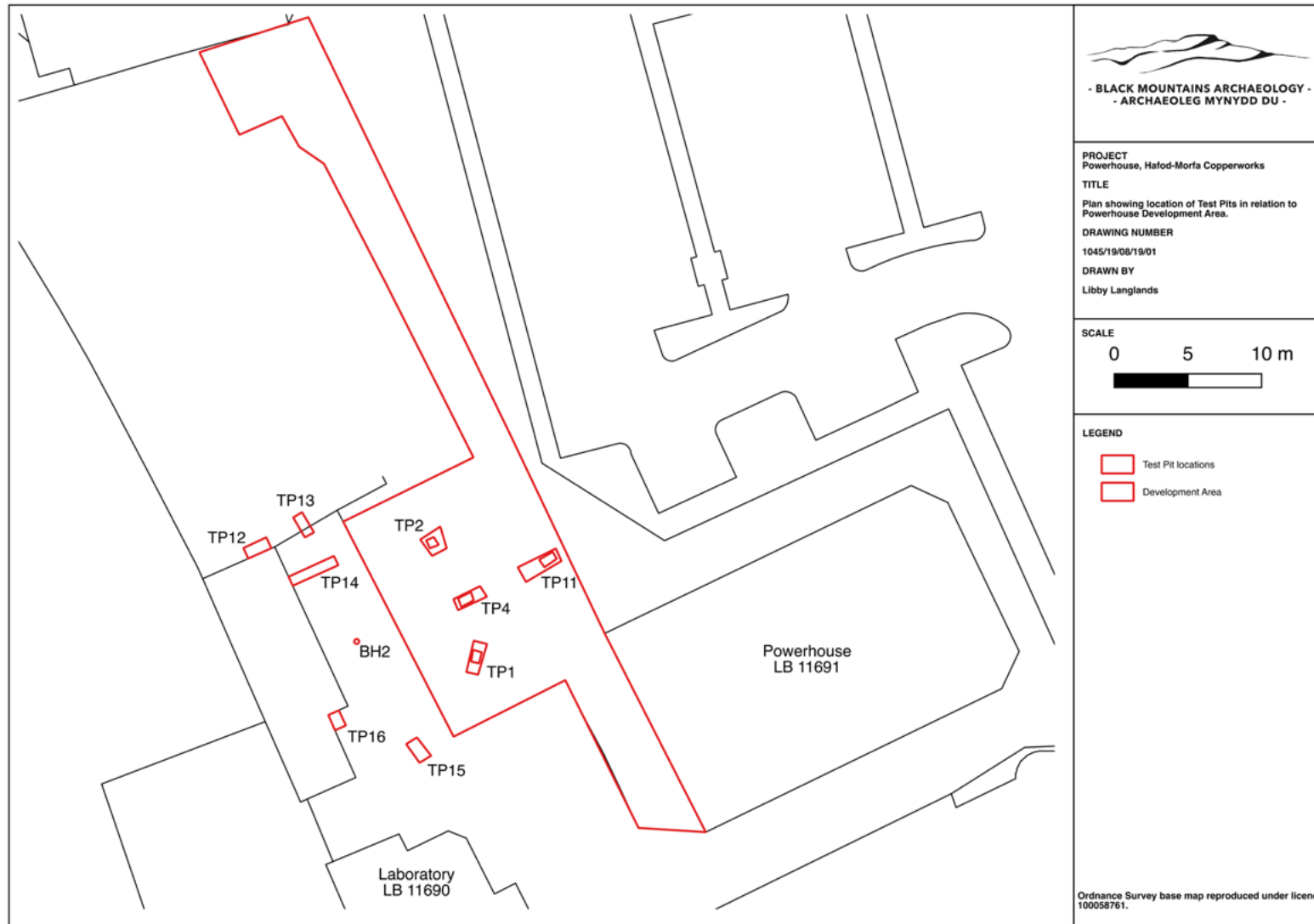


Figure 1. Plan showing locations of Test Pits in relation to the Powerhouse Development Area.



Figure 2. Plan showing locations of Test Pits in relation to the 1879 First Edition Ordnance Survey Map.

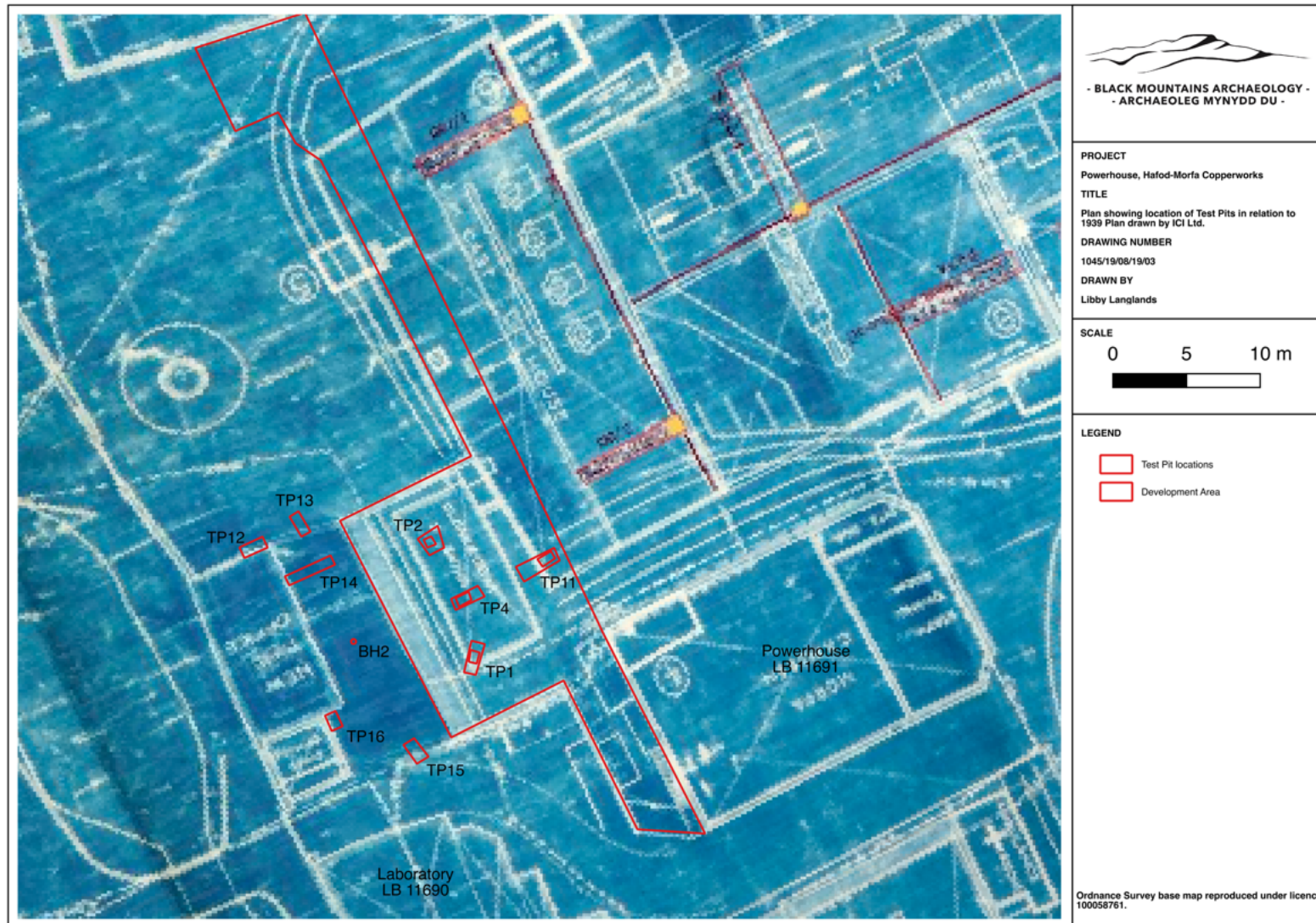


Figure 3. Plan showing locations of Test Pits in relation to a 1939 plan drawn by ICI Ltd.

13.35mOD 

 NE

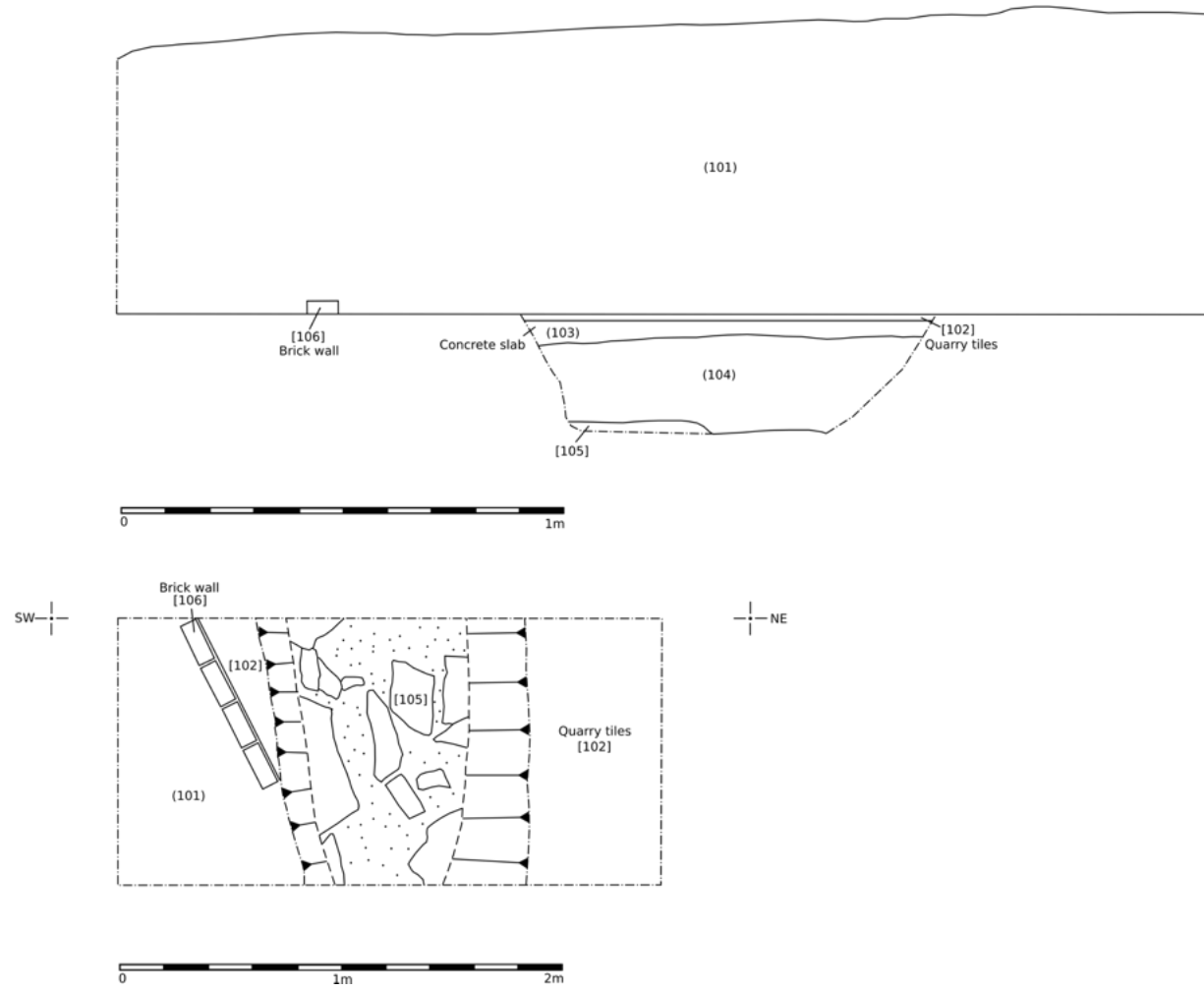


Figure 4. Plan and section of Test Pit 1

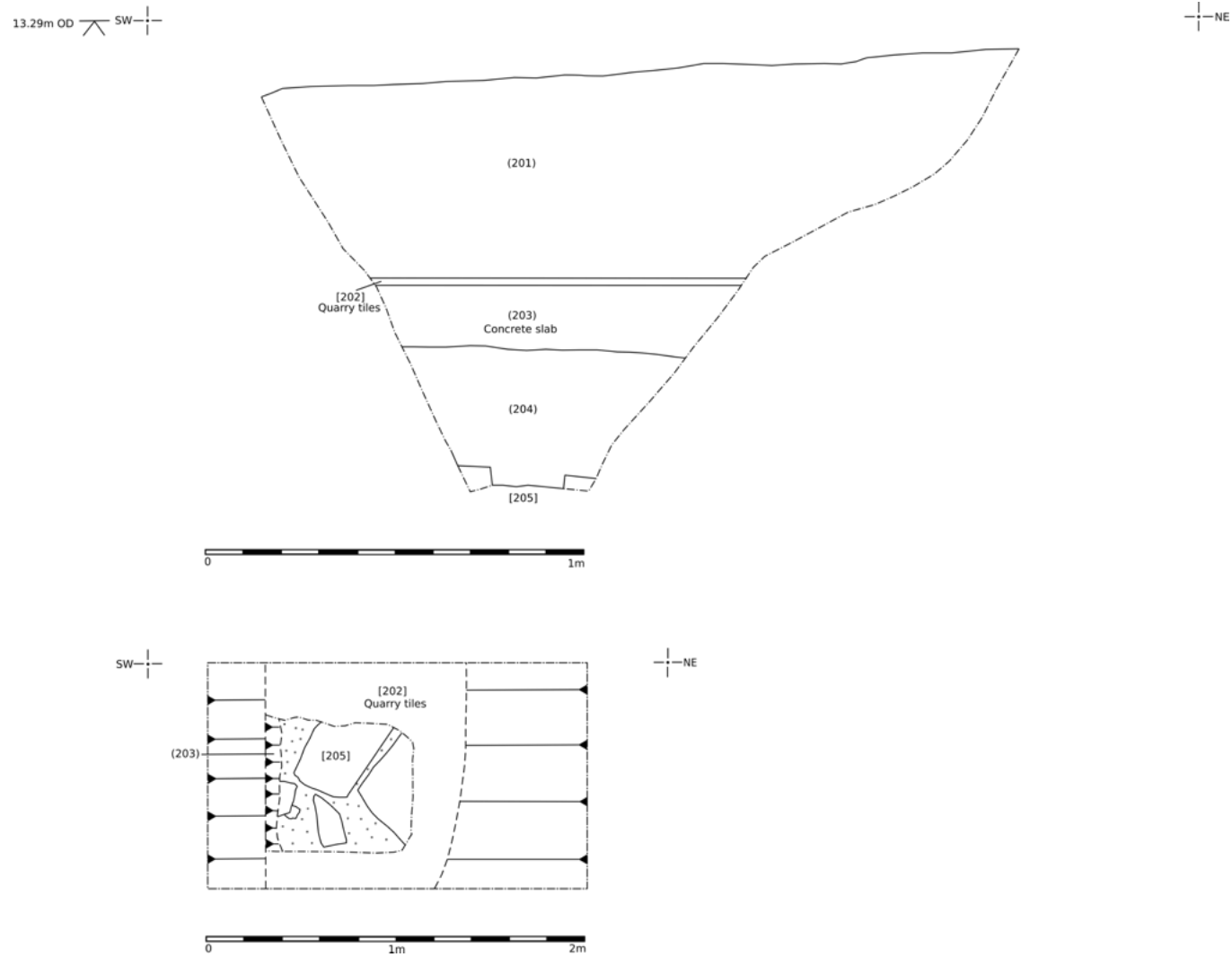


Figure 5. Plan and section of Test Pit 2

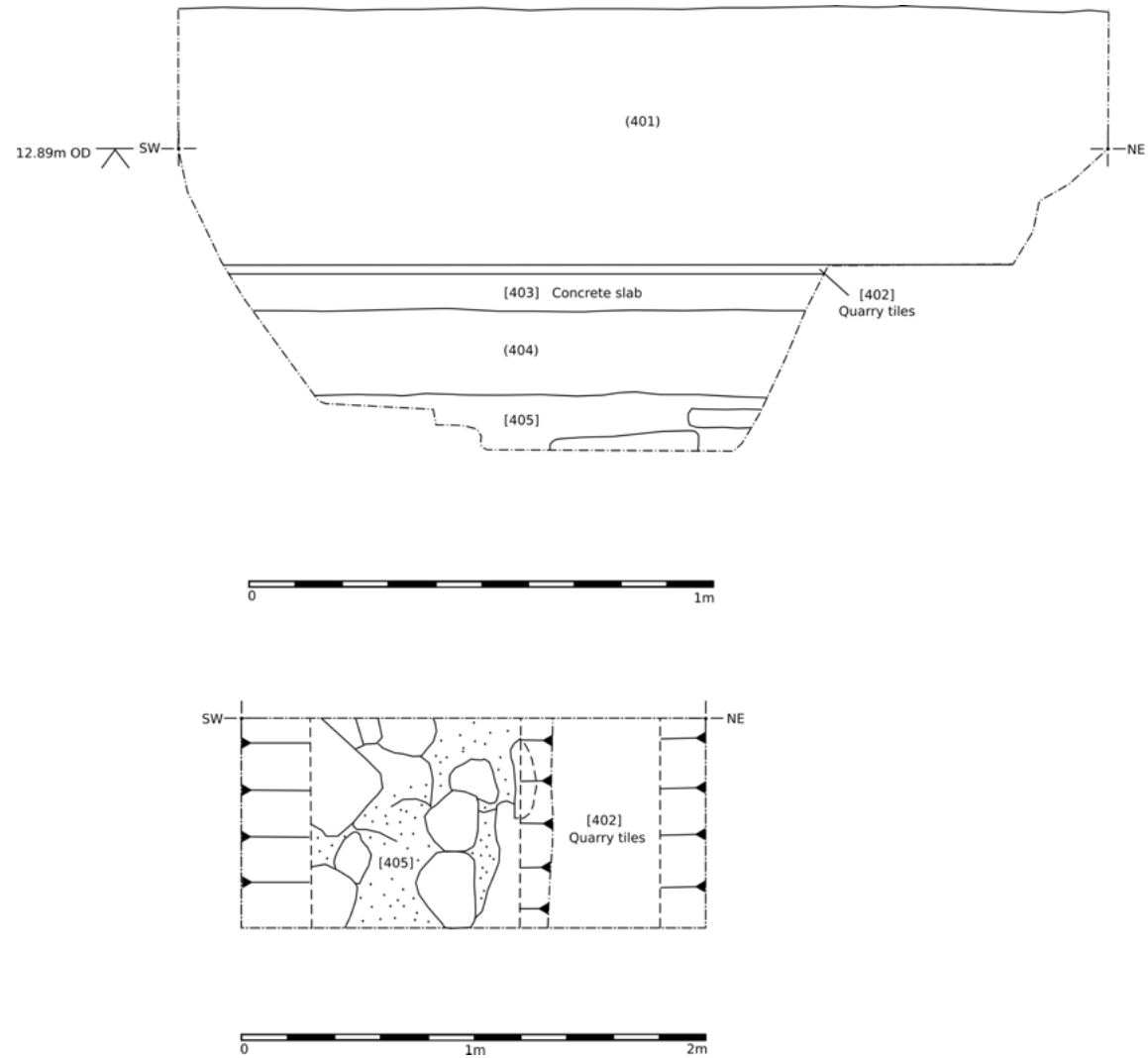


Figure 6. Plan and section of Test Pit 4

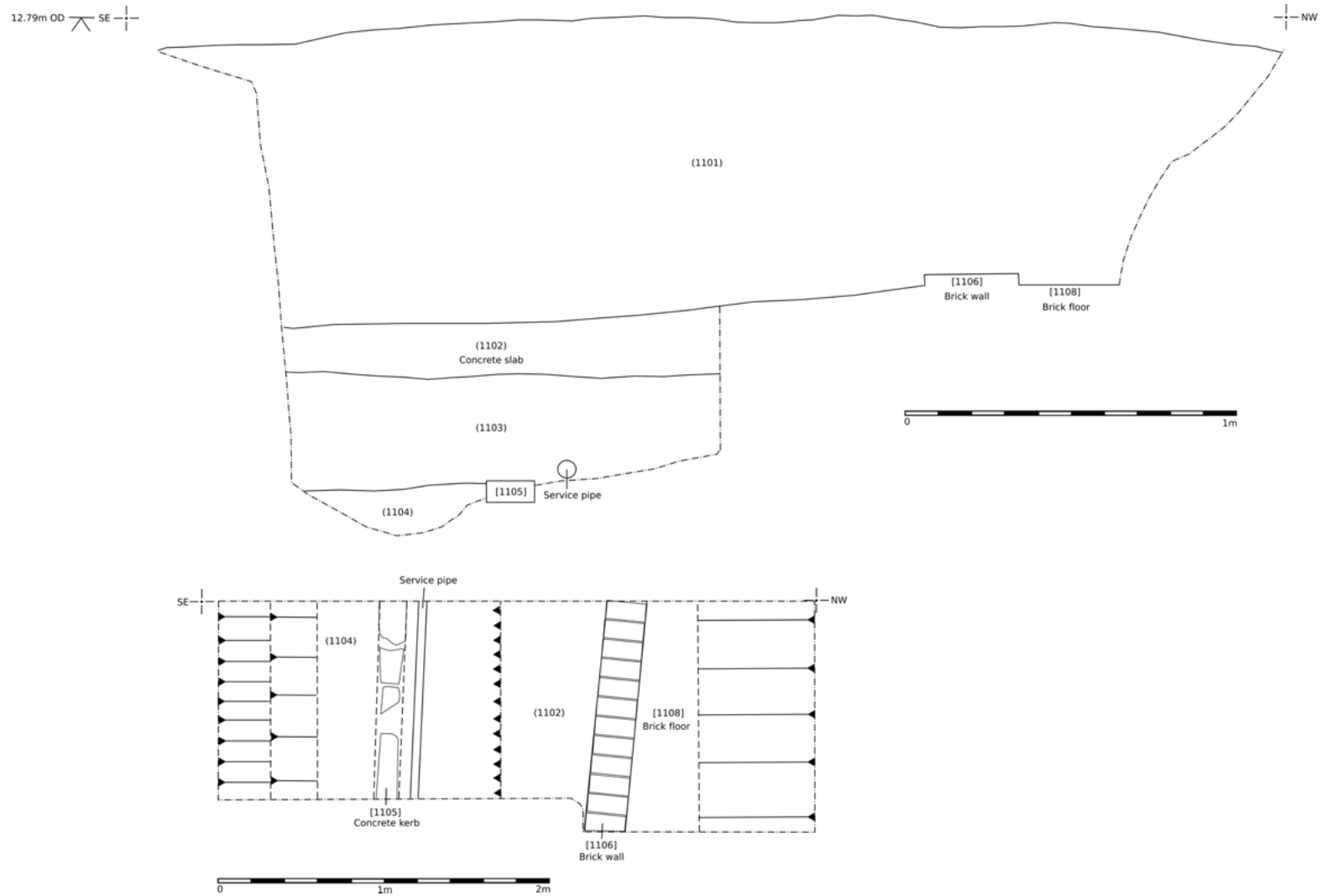


Figure 7. Plan and section of Test Pit 11

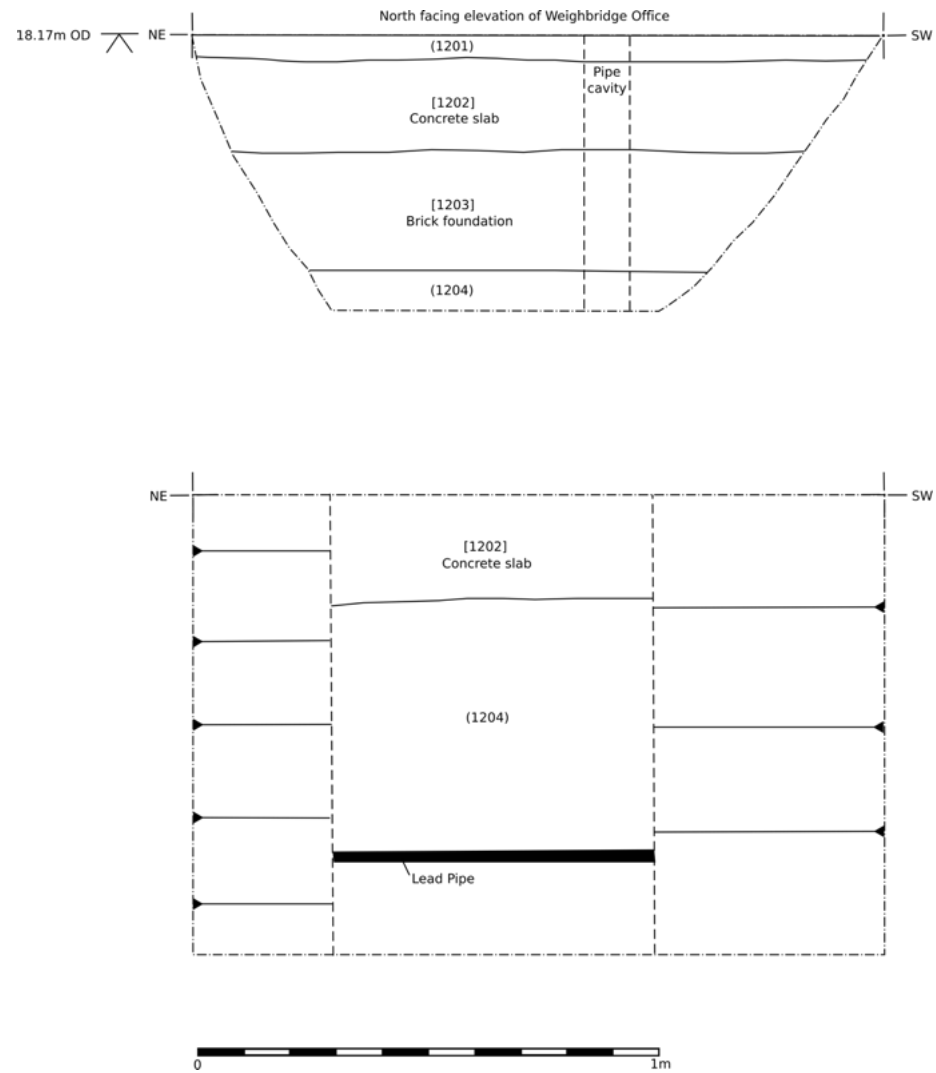


Figure 8. Plan and section of Test Pit 12

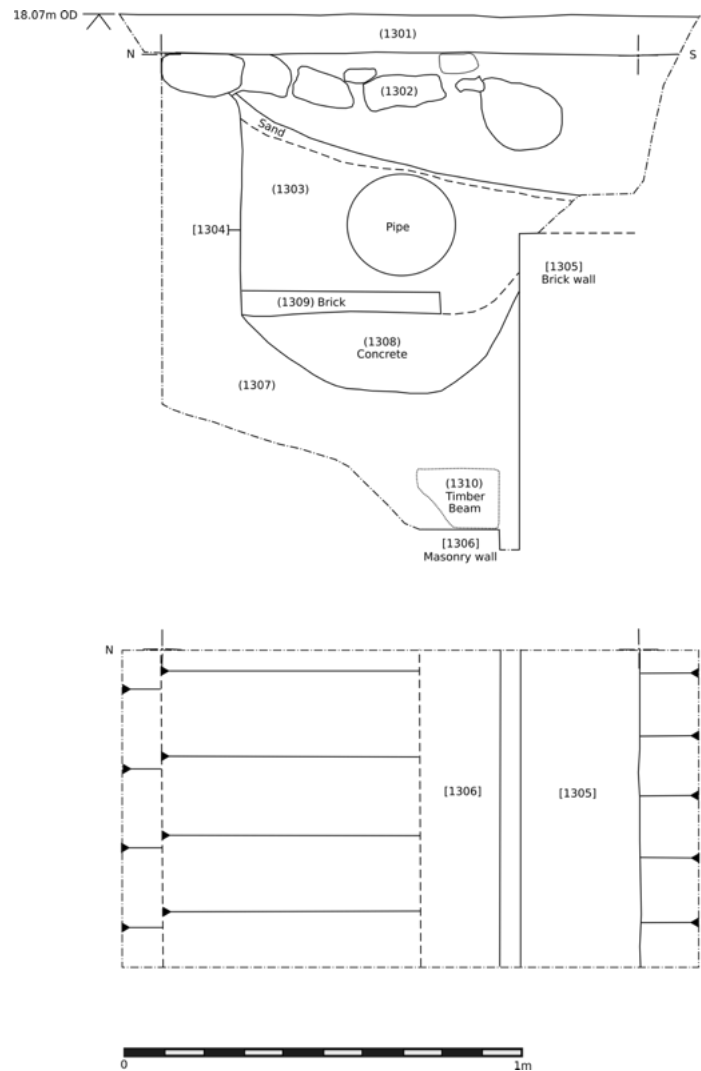


Figure 9. Plan and section of Test Pit 13

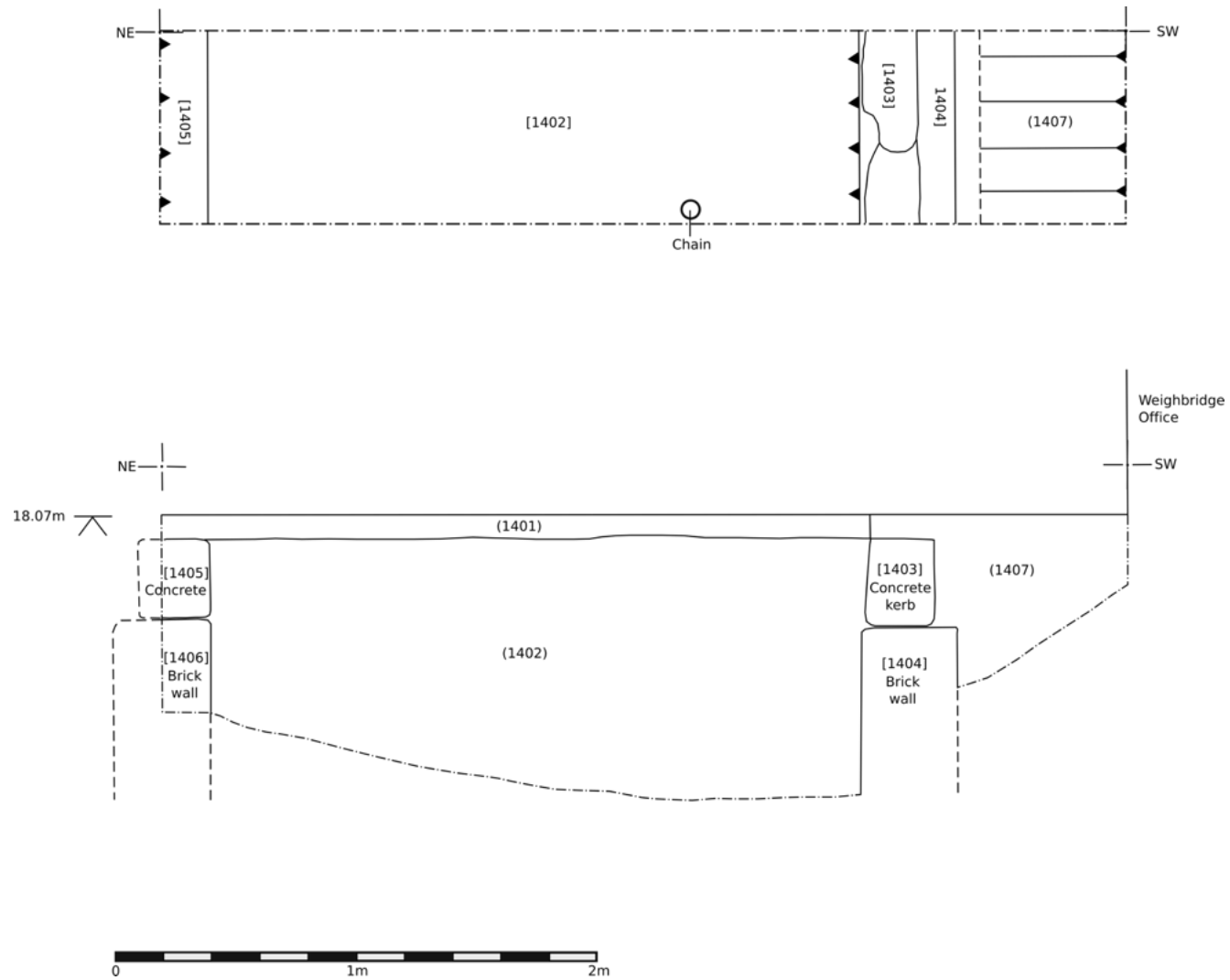


Figure 10. Plan and section of Test Pit 14

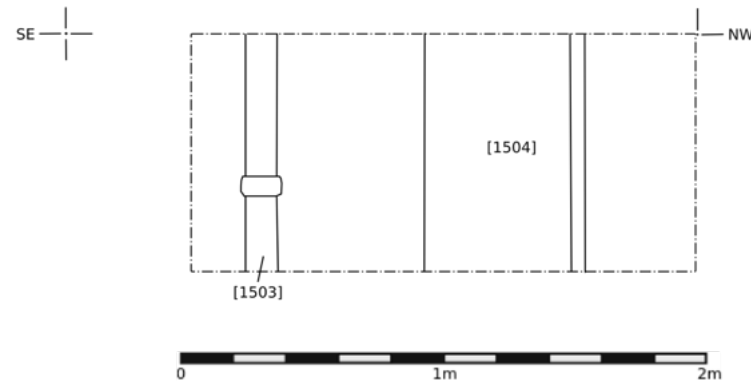
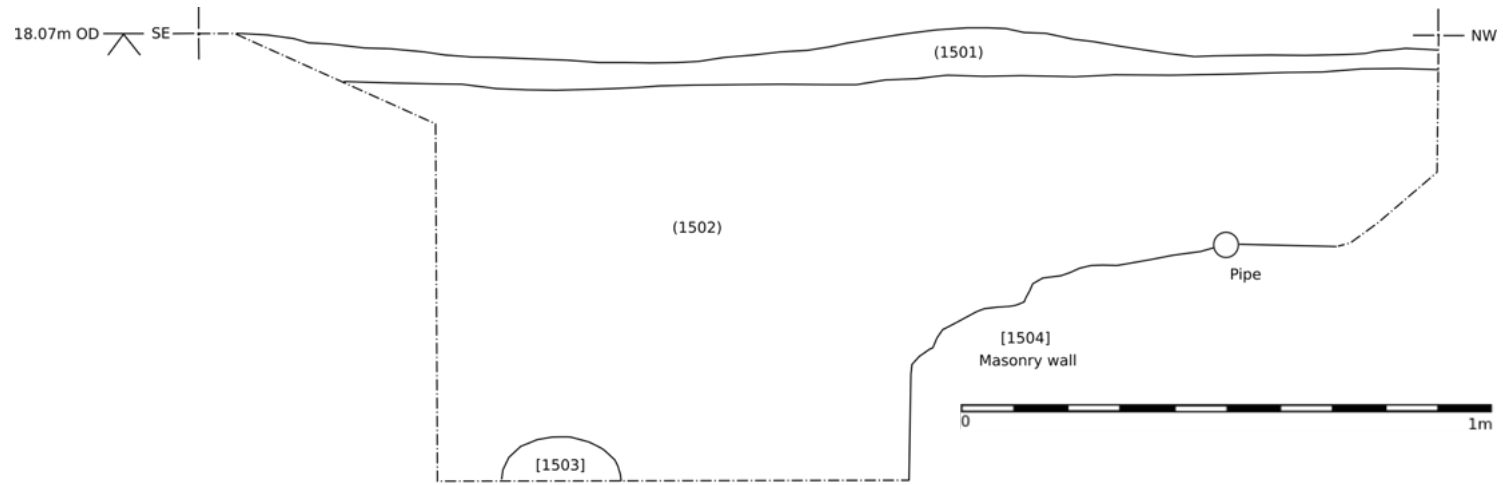


Figure 11. Plan and section of Test Pit 15

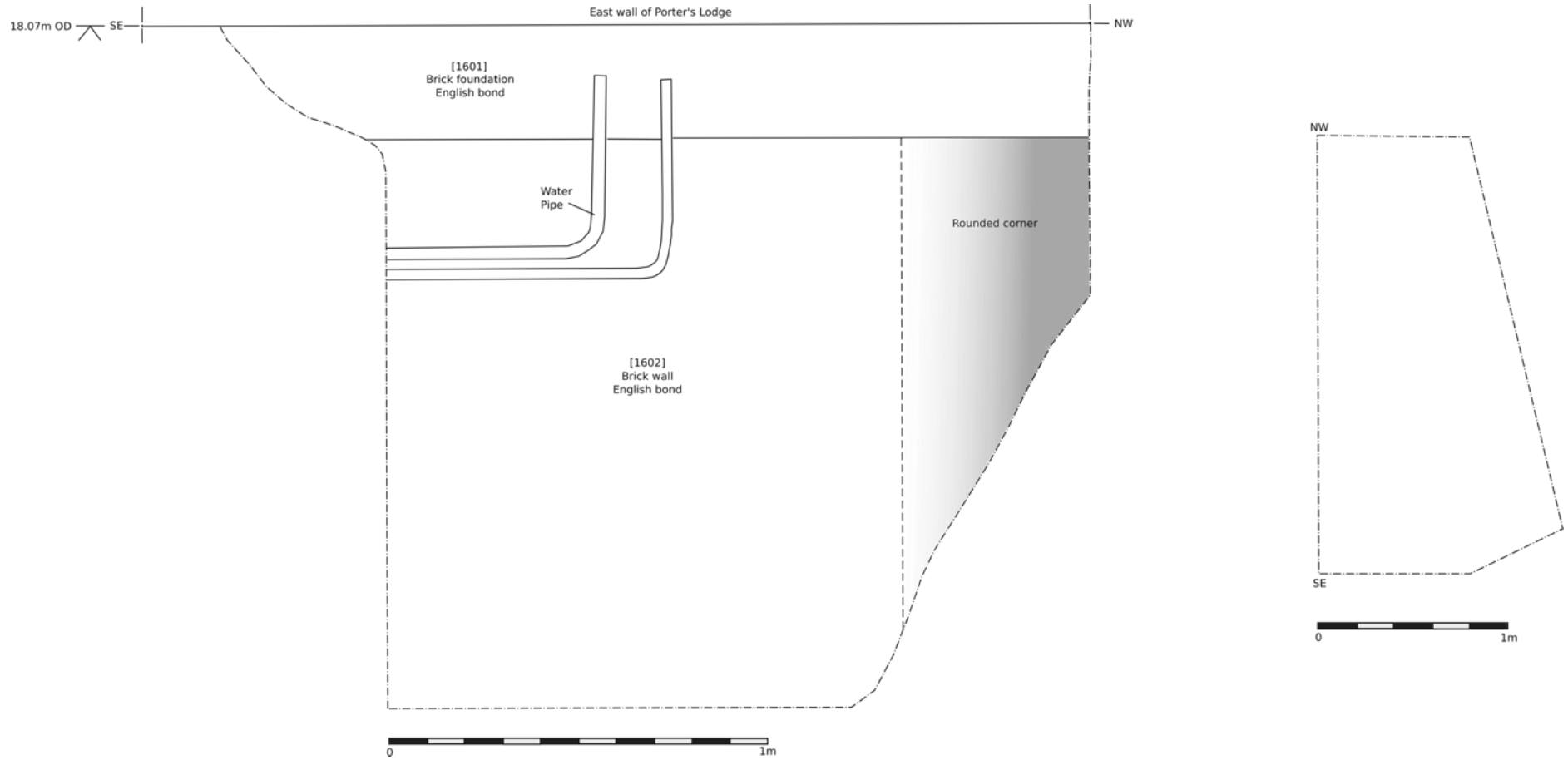


Figure 12. Plan and section of Test Pit 16

6.2 Appendix II: Plates



Plate 1. Pre-excitation view, facing north, of Test Pit 1 showing quarry tile floor [102].



Plate 2. Post-excitation view, facing north, of Test Pit 1 showing quarry tile floor [102] and masonry structure [105].

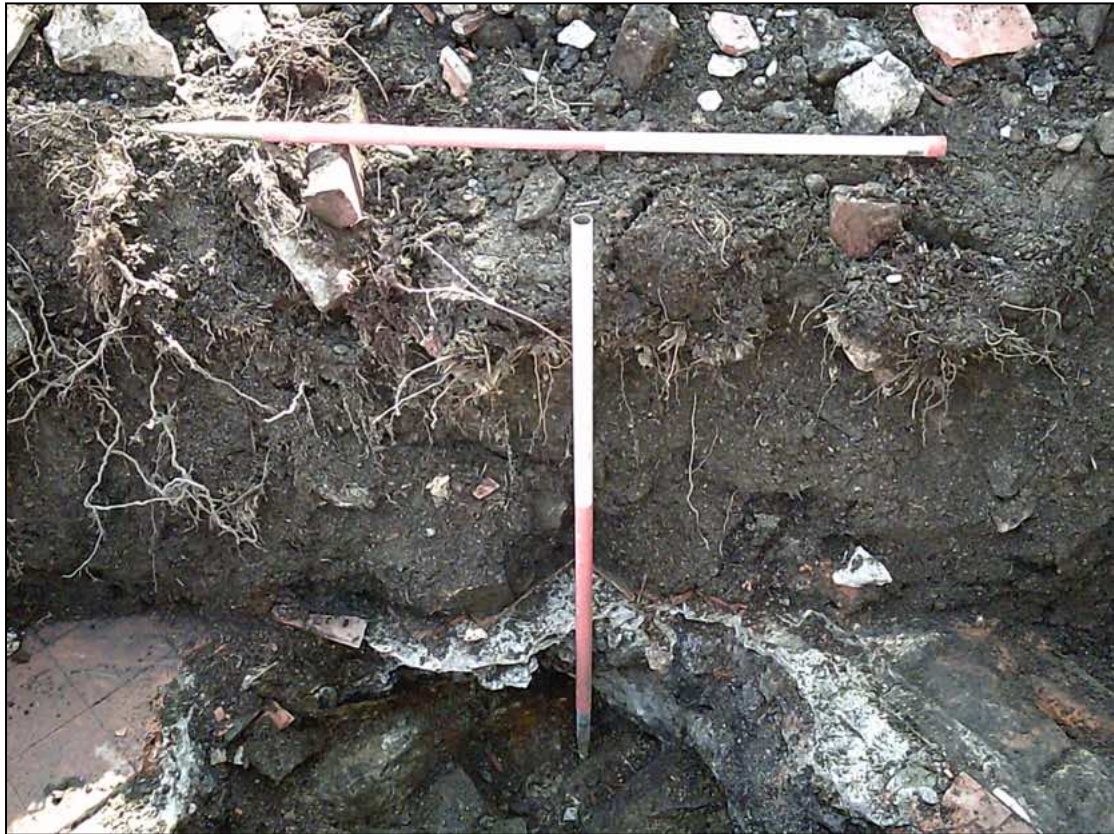


Plate 3. West facing section of Test Pit 1 showing quarry tile floor [102] and masonry structure [105].



Plate 4. West facing section of Test Pit 1 showing quarry tile floor [102] and masonry structure [105].



Plate 5. Pre-excitation view, facing west, of Test Pit 2 showing quarry tile floor [202].



Plate 6. South facing section of Test Pit 2 showing quarry tile floor [202] and masonry structure [205].



Plate 7. West facing section of Test Pit 2 showing detail of masonry structure [205].



Plate 8. General view, facing west, of Test Pit 4 showing quarry tile floor [402].

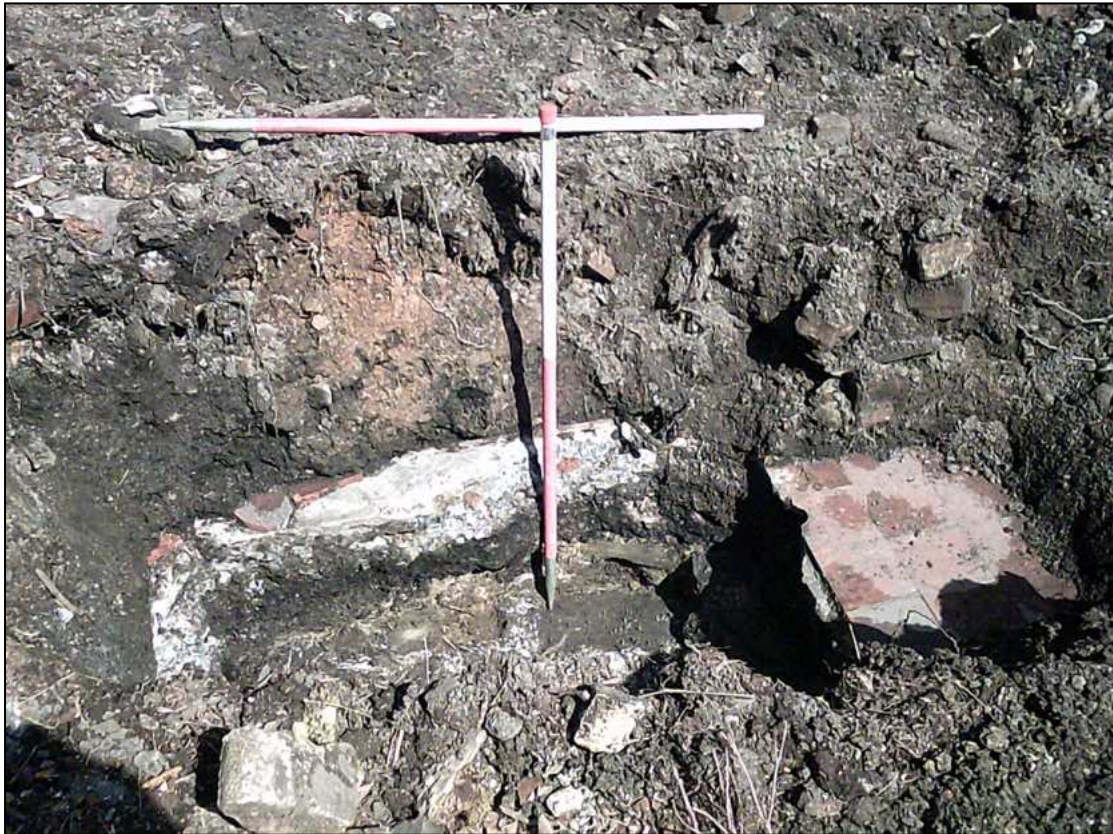


Plate 9. South facing section of Test Pit 4 showing quarry tile floor [402] and masonry structure [405].



Plate 10. Plan view, facing south, showing detail of Test Pit 4 masonry structure [405].



Plate 11. 20th Century white glazed stoneware recovered from deposit (404) in Test Pit 4.



Plate 12. Plan view, facing south, of Test Pit 11 showing N/S brick wall [1106], brick floor [1108] and concrete slab [1102] prior to excavation.



Plate 13. North facing section of Test Pit 11 showing concrete slab (1102) and underlying slag-rich deposit (1104).



Plate 14. Plan view, facing east, showing *in-situ* lead service pipe, N/S aligned kerb and adjacent slag-rich deposit (1104).



Plate 15. South facing section of Test Pit 11 showing N/S brick wall [1106] and brick floor [1108].



Plate 16. Cast copper bar recovered from base of deposit (1103) in Test Pit 11.



Plate 17. North facing section of Test Pit 12 showing foundation pier [1203] and concrete foundation slab [1202]. The *in-situ* lead pipe can be seen in the foreground.



Plate 18. West facing section of Test Pit 13 showing E/W pipe trench [1304]/(1303) and the north wall of the weighbridge [1305] to the right of the picture. The vertical scale is standing on E/W masonry wall [1306].



Plate 19. North facing section of Test Pit 13 showing the north wall of the weighbridge [1305]. The vertical scale is standing on E/W masonry wall [1306].



Plate 20. Plan view, facing east, showing the north wall of the weighbridge [1305] and E/W masonry wall [1306] immediately to its left in the picture in Test Pit 13.



Plate 21. General view, facing west, of Test Pit 14.



Plate 22. West facing section of Test Pit 14 showing the east wall of the weighbridge [1406] and concrete kerb [1405].



Plate 23. East facing section of Test Pit 14 showing the west wall of the weighbridge [1404] and concrete kerb [1303]. Also showing demolition rubble infill deposit (1402).



Plate 24. Plan view, facing west, of the west wall of the weighbridge [1404] and concrete kerb [1403] in Test Pit 14.



Plate 25. Examples of arch bricks recovered from weighbridge infill deposit (1402) in Test Pit 14.



Plate 26. Large chain recovered from weighbridge infill deposit (1402).



Plate 27. General view, facing south east, of Test Pit 15 showing NW/SE aligned masonry wall [1504].



Plate 28. North west facing section of Test Pit 15 showing E/W aligned masonry wall [1504].



Plate 29. Large gauge NW/SE aligned metal water pipe uncovered in the base of Test Pit 15.



Plate 30. South east facing section of Test Pit 15 showing masonry wall [1504].



Plate 31. North East facing section of Test Pit 16 showing Porter's Lodge foundations and earlier wall [1602] with its curved feature to the right of the picture.



Plate 31. Hand drawn ICI Plan of the Hafod-Morfa Copperworks (1951). C&S.



Plate 32. Silverstack chimney and cast house (Document ref D3451). ©West Glamorgan Archives

6.3 Appendix III: Context Inventory

6.3.1 Test Pit 1

6.3.2 Test pit length 2.47m x 1.2m with a depth of 0.9m and was aligned SW/NE. Test Pit 1 was positioned within the footprint of the proposed visitor centre. It was also positioned over buildings shown on historic mapping; a 'Cloakroom & Baths' marked on a 1939 ICI Plan and an earlier building marked on the First Edition Ordnance Survey Map. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.

Table 2. Context Inventory

Context	Type	Depth	Description	Period
101	Deposit	0-0.6m	Dark grey brown demolition rubble with a depth of 0.6m. It was a very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste.	Modern
102	Structure	0.6-0.62m	Quarry tiled floor surface consisting of 15x15x2cm machine-made red quarry tiles bedded on an 3-7cm thick concrete slab [103].	Modern
103	Structure	0.62-0.7m	3-8cm thick concrete slab beneath quarry tiled floor [102].	Modern
104	Deposit	0.7-0.9m	18-20cm layer of dark grey-black, coal dust-rich, loose silty loam with very few inclusions apart from very occasional CBM flecks and fragments <5cm.	Modern
105	Structure	0.9m n.b	Substantial masonry structure extending across the whole test pit. Constructed of limestone rubble blocks of c. 10-25cm bonded in a white lime mortar with charcoal flecks that is mostly very compact with some soft and yellowed areas where water damage has occurred	Modern
106	Structure	0.6m n.b	NE/SW aligned red brick cavity wall or drain [106] with the remains of a brown ceramic 2" drain pipe <i>in-situ</i> . This may represent the external wall or, more likely, an internal division of the 'Cloakroom & Baths' building.	Modern

All depths below present ground surface. n.b = not bottomed

6.3.3 Test Pit 2

6.3.4 Test pit length 2m x 1.2m with a depth of 1.2m and was aligned NE/SW. Test Pit 2 was positioned within the footprint of the proposed visitor centre. Like the previous test pit, it was positioned over buildings shown on historic mapping; a 'Cloakroom & Baths' marked on a 1939 ICI Plan and an earlier building marked on the First Edition Ordnance Survey Map. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
201	Deposit	0-0.6m	Demolition rubble with a depth of 60cm. It was a very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste.	Modern
202	Structure	0.6-0.62m	Quarry tiled floor surface consisting of 15x15x2cm machine-made red quarry tiles bedded on a 17-20cm thick concrete slab [203]	Modern
203	Structure	0.62-0.82m	17-20cm thick concrete slab beneath quarry tiled floor [202].	Modern
204	Deposit	0.82-1.2m	30-38cm layer of dark grey-black, coal dust-rich, loose silty loam with very few inclusions apart from very occasional CBM flecks and fragments <5cm.	Modern
205	Structure	1.2m n.b	Substantial masonry structure extending across the whole test pit. Constructed of limestone rubble blocks of c. 10-25cm bonded in a white lime mortar with charcoal flecks that is mostly very compact with some soft and yellowed areas where water damage has occurred	Modern

All depths below present ground surface. n.b = not bottomed

6.3.5 Test Pit 4

6.3.6 Test pit length 2m x 0.9m with a depth of 0.95m and was aligned NE/SW. Test Pit 4 was positioned in the centre of the footprint of the proposed visitor centre. Like the previous test pits, it was positioned over buildings shown on historic mapping; a 'Cloakroom & Baths' marked on a 1939 ICI Plan and an earlier building marked on the First Edition Ordnance Survey Map. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
401	Deposit	0-0.55m	Demolition rubble had a depth of 55cm. It was a very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste	Modern
402	Structure	0.55-0.57m	Quarry tiled floor surface consisting of 15x15x2cm machine-made red quarry tiles bedded on a 8cm thick concrete slab [403]	Modern
403	Structure	0.57-0.65m	8cm thick concrete slab beneath quarry tiled floor [402].	Modern
404	Deposit	0.65-0.83m	18cm layer of dark grey-black, coal dust-rich, loose silty loam (404) with very few inclusions apart from very occasional CBM flecks and fragments <5cm	Modern

405	Structure	0.83-0.95m n.b	Substantial masonry structure extending across the whole test pit. Constructed of limestone rubble blocks of c. 10-25cm bonded in a white lime mortar with charcoal flecks that is mostly very compact with some soft and yellowed areas where water damage has occurred	Modern
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All depths below present ground surface. n.b = not bottomed

6.3.7 Test Pit 11

6.3.8 Test pit length 3.5m x 1.2m with a depth of 1.50m and was aligned NE/SW. Test Pit 11 was positioned outside and to the east of the apparent footprint of the 'Cloakroom & Baths' building and the earlier N/S aligned building. The purpose of the test pit was to find a suitable position for a borehole as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
1101	Deposit	0-0.9m	Demolition rubble (1101) had a depth of 90cm. It was a very loose and friable silty loam containing fragments of brick, tile, slate and other general demolition material and industrial waste	Modern
1102	Deposit	0.9-1.1m	Concrete slab to the East of NW/SE aligned wall [1106] with a thickness of 17-20cm.	Modern
1103	Deposit	1.1-1.4m	30-33cm deep deposit of dark-grey black, coal dust-rich loose silty loam (1103) that contained very few inclusions apart from occasional CBM and some cast copper waste.	Modern
1104	Deposit	1.4m-1.5m n.b	To the east of TP11. Very hard and compact dark grey black metallised surface (1104) below concrete slab (1103) that contained a high frequency of copper slag and copper waste fragments.	Modern
1105	Structure	1.4m n.b	Concrete kerb running NW/SE adjacent to an unknown NW/SE aligned service pipe. At the base of deposit (1103). To the west of metallised deposit (1104) but relationship requires further investigation.	Modern
1106	Structure	0.77m n.b	Base of a NW/SE aligned brick wall constructed of red un-frogged bricks. 28cm wide and crossed the width of the test pit. Abutted on its west side by a brick-lined floor [1108]. To the west of TP11.	Modern
1107	Deposit	0.15 n.b	Concrete L-shaped section of pavement (1107) at the western end of the test pit at a depth of c.15cm, which was left <i>in-situ</i> and formed the western edge of the remaining test pit.	Modern
1108	Structure	0.8m n.b	Brick-lined floor. Abutting NW/SE aligned wall [1106]. To the west of TP11.	Modern

All depths below present ground surface. n.b = not bottomed

6.3.9 Test Pit 12

6.3.10 Test pit length 1.45m x 0.8m with a depth of 1.35m and was aligned NE/SW. Test Pit 12 was positioned adjacent the north wall of the weighbridge office. The purpose of the test pit was to investigate ground deposits as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
1201	Deposit	0-0.6m n.b	A loose dark grey brown silty loam demolition rubble containing fragments of brick and other waste material.	Modern
1202	Structure	0.05-0.25m	Concrete slab (1202) with a thickness of c.20cm	Modern
1203	Structure	0.25-0.5m	Brick foundation was uncovered consisting of three courses of red brick with no mortar.	

All depths below present ground surface. n.b = not bottomed

6.3.11 Test Pit 13

6.3.12 Test pit length 1.45m x 0.8m with a depth of 1.35m and was aligned NW/SE. Test Pit 13 was located to the east of the weighbridge office in line with the north revetment wall. The purpose of the test pit was to investigate ground deposits as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
1301	Deposit	0-0.1m	Tarmac surface	Modern
1302	Deposit	0.1-0.45m	Shallow Layer of demolition rubble (1302) which consisted of a dark grey brown silty loam containing fragments and whole brick and other waste material	Modern
1303	Deposit	0.2-0.95m	Fill of pipe trench [1304] consisting of concrete and brick base, ceramic waste pipe and rubble and sand backfill material .	Modern
1304	Cut	0.2-0.95m	NE/SW aligned pipe trench with a total depth of 0.75m.	Modern
1305	Structure	0.55m-1.35m n.b	NE/SW aligned brick wall [1305] the top of which was at a depth of 55cm from the surface. The wall was constructed of red frogged bricks and concrete mortar and represents the north wall of the weighbridge.	Modern
1306	Structure	1.3m-1.35m n.b	Masonry wall [1306] was aligned NE/SW and appeared to be in line with the north revetment wall. Appeared to be constructed of limestone rubble with lime mortar.	Modern
1307	Deposit	0.2-1.35m	Dark grey brown silty loam demolition rubble containing bricks and other waste material.	Modern
1308	Deposit	0.75-1.05m	Poured concrete levelling deposit within pipe trench [1304].	Modern
1309	Deposit	0.7-0.75m	Roughly laid brick layer on top of concrete (1308). No mortar.	Modern
1310	Deposit	1-15-1.3m	Timber beam (well-rotted) that was situated on top of masonry wall [1306].	Modern

All depths below present ground surface. n.b = not bottomed

6.3.13 Test Pit 14

6.3.14 Test pit length 4m x 0.8m with a total depth of 1.2m and was aligned NE/SW. Test Pit 14 was located to the east of the weighbridge office. The purpose of the test pit was to investigate ground deposits as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
1401	Deposit	0-0.1m	Tarmac surface	Modern
1402	Deposit	0.1-1.2m n.b	Dark grey brown silty loam demolition rubble containing bricks and other waste material.	Modern
1403	Structure	0.1-0.45m	Concrete kerbstone [1403] aligned NW/SE in parallel with the weighbridge office building	Modern
1404	Structure	0.45-1.2m n.b	NW/SE aligned brick wall [1404] constructed of frogged red bricks and cement mortar. West wall of weighbridge.	Modern
1405	Structure	0.01-0.45m	Concrete kerb [1405] directly beneath tarmac (1401) at the eastern end of the test pit.	Modern
1406	Structure	0.45-1.2m n.b	NW/SE aligned red brick wall [1406] constructed of frogged red bricks and cement mortar. East wall of weighbridge.	Modern
1407	Deposit	0-0.7m n.b	Demolition rubble which consisted of a dark grey black silty loam containing bricks and other waste material. West of tarmac (1401).	Modern

All depths below present ground surface. n.b = not bottomed

6.3.15 Test Pit 15

6.3.16 Test pit length 1.95 x 0.9m with a total depth of 0.85m and was aligned NW/SE. Test Pit 15 was located to the east of the Porter's Lodge and Main Entrance. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
1501	Deposit	0-0.1m	Tarmac surface	Modern
1502	Deposit	0.10-0.85m n.b	Demolition rubble which consisted of a dark grey black silty loam containing bricks and other waste material.	Modern
1503	Pipe	0.75-0.85m n.b	Large NE/SW aligned metal pipe to the south of wall [1504]	Modern
1504	Structure	0.4-0.85m n.b	NE/SW aligned masonry wall which appeared to be constructed of limestone rubble with lime mortar and in line with the south revetment wall.	Modern

All depths below present ground surface. n.b = not bottomed

6.3.17 Test Pit 16

6.3.18 Test pit length 2.3 x 1.3m with a total depth of 1.8m and was aligned NW/SE. Test Pit 16 was located in the corner between the south wall of the Weighbridge Office and the east wall of the Porter's Lodge. The purpose of the test pit was to investigate buried ground deposits as part of Hydrock's ground investigation works.

Context	Type	Depth	Description	Period
1601	Structure	0-0.3m	Foundation of east wall of Porter's Lodge constructed of three courses of yellow brown brick with lime mortar.	Modern
1602	Structure	0.3-1.8m n.b	This wall was constructed of orangey red bricks with lime mortar and featured a wide, rounded return that curved to the west beneath the Porter's Lodge. Wall [1602] may be related to the west wall, and entranceway, of the historic canal basin.	Modern
1603	Deposit	0-1.8m n.b	Demolition rubble consisting of dark grey black silty loam containing bricks and other waste material.	Modern

All depths below present ground surface. n.b = not bottomed

6.3.19 Borehole 1

6.3.20 Borehole dimensions c. 25 x 25cm with a depth of 20m. Borehole 1 was positioned in the southwest corner of the Rolling Mill (Museum Collection) compound.

Context	Type	Depth	Description	Period
011	Deposit	0-0.25m	Topsoil	Modern
012	Deposit	0.25-0.65m	Dark grey compact sandy loam demolition rubble containing ash, fragments of stone and brick.	Modern
013	Deposit	0.65-1m	Loose light orangey yellow sand relating to an unknown service trench. The service trench was covered with a ceramic service cover.	Modern
014	Deposit	1-2m	Mid pinkish grey clay loam with few inclusions. Some 5-10cm rounded sandstone boulders. Occasional flecks of green copper and very occasional CBM. Occasional iron panning.	Modern
015	Deposit	2-3.10m	Mid pinkish grey loam more clayey than above. Frequent sandstone boulders 5-15cm and smaller pebbles 2-5cm. Very occasional fleck of green copper. Bright orange deposits suggesting iron panning.	Modern
016	Deposit	3.10-5m	Greyish yellow silty clay with frequent 5-10cm rounded boulders and smaller 2-5cm pebbles. Frequent fragments of slag up to 15cm.	Modern
NAT	NAT	5-40m	Natural	n/a

All depths below present ground surface. n.b = not bottomed

6.3.21 Borehole 2

6.3.22 Borehole dimensions c 25 x 25cm with a depth of 30m. Borehole 2 was positioned in the centre of the upper weighbridge area to the north of the Morfa entrance. It is within the footprint of the former Morfa canal basin that was infilled in the 1920s prior to the construction of the Weighbridge and the Porter's Lodge.

Context	Type	Depth	Description	Period
021	Deposit	0-0.05m	Modern tarmac	Modern
022	Deposit	0.05-2m	Compact dark brown silty sand demolition rubble containing fragments of brick and slag.	Modern
023	Structure	0.05-1m n.b	A red brick E/W aligned wall within the north facing section of borehole 2 which continued to the base of the hand dug section. The position of the drill was adjusted to avoid this feature.	Modern
024	Deposit	2-3m	Dark brownish-grey silty clay rubble containing fragments of CBM, brick and slag.	Modern
025	Deposit	3-4m	Dark bluish grey silty clay containing significant amounts of coal dust and very small coal fragments. Represents the base of the clay-lined canal basin illustrated on historic mapping (Figure 2).	Modern
026	Deposit	4-5.5m	Mid bluish grey silty clay containing no archaeological inclusions. Some sub-angular and rounded sandstone inclusions ranging from c.10-30cm and becoming smaller and more gravelly towards base of deposit.	Natural
027	Deposit	5-11.30m	Mid brown clayey silt containing gravel and sandstone boulders. At the base of this deposit a large grey sandstone boulder was hit and drilling ceased.	Natural
NAT	NAT	11.30-42m	Natural	n/a

All depths below present ground surface. n.b = not bottomed

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Ffôn/Tel. 07834715033

E-bost/Email. richard@bmarchaeology.com

Gwefan/Web. <https://blackmountainsarchaeology.com/>

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