

**Additional Land for Plant,
Hafod-Morfa Copperworks
Rapid Assessment**

**Prepared
for**

City and County of Swansea

By



**- BLACK MOUNTAINS ARCHAEOLOGY -
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Summary

Comisiynwyd Archeoleg Mynydd Du Cyf gan GWP Architects, ar rhan Cyngor Dinas a Sir Abertawe, i ymgymryd a asesiad cyflym ar gyfer darn ychwanegol o dir sy'n ofynnol ar gyfer peiriannau fel rhan o ailddatblygiad parhaus y Pwerdy Morfa at y cyn-Weithiau Copr Hafod-Morfa (2018/0837/LBC & 2018/0836/FUL).

Mae'r ardal ddatblygu arfaethedig yn union i'r de o'r Pwerdy Morfa (LB11691) yn lleoliad y Pwerdy Morfa ac Ystafell Boeler (GGAT08261) (Ffigur 1). Datgelodd gwerthusiad maes archeolegol a gynhaliwyd yn 2018 fod goroesiad yn yr ardal hon yn uchel, gydag arwynebau llawr teils chwarel cyfan, sylfeini a seiliau peiriannau, yn ogystal â llithren lo bosibl, dim ond 0.1m o dan wyneb presennol y ddaear. Canfuwyd bod strwythurau ac adneuon pellach yn sail i'r nodweddion hyn (Eyre-Morgan a Morgan 2021, Ffigur 1, Platiau 8–12).

Daeth yr asesiad i'r casgliad bod byddai'r datblygiad arfaethedig yn cael effaith uniongyrchol ar dau ased treftadaeth: y Pwerdy Hafod/Ystafell Boeler (GGAT08261, Platiau 1–7) a Wal Gwrthglawdd (GGAT08258w) a fyddai'n gofyn am liniaru archeolegol ar ffurf Stripio Mapio Recordio (SMR) o'r ardal ddatblygiad.

Byddai'r datblygiad arfaethedig yn cael effaith ar osodiad y Pwerdy Morfa (LB11691) a'r Labordy Hafod-Morfa (LB11690), y gellid ei leihau trwy ddefnyddio deunyddiau sympathetig. Yn dibynnu ar y dyluniad, gall y datblygiad arfaethedig hefyd effeithio ar osodiad y Swyddfa Pontpwyso (GGAT08239w), Porthdy Porthorion (GGAT08219w) a'r Mynediad Morfa (GGAT08220w).

Ymgymrwyd asesiad effaith llawn ar gyfer yr ailddatblygiad Pwerdy gan Rubicon Heritage Services Ltd yn 2018 (Morgan 2018). Mae'r adroddiad presennol yn asesiad cyflym o effaith y tir ychwanegol yn unig ac yn gydymffurfio â'r Standard and Guidance for a Desk-based Assessment gan y Chartered Institute for Archaeologists (CIfA) (cyhoeddwyd 2014, diwygiwyd 2020).

Black Mountains Archaeology Ltd have been commissioned by GWP Architects, on behalf of City and County of Swansea Council, to undertake a rapid assessment for an additional area of land required for plant as part of the ongoing Morfa Powerhouse redevelopment at the former Hafod-Morfa Copperworks (2018/0837/LBC & 2018/0836/FUL).

The proposed development area lies directly south of the Morfa Powerhouse (LB11691) in the location of the Hafod Powerhouse and Boiler Room (GGAT08261) (Figure 1). An archaeological field evaluation undertaken in 2018 revealed that survival in this area is high, with intact quarry tiled floor surfaces, footings and machine bases, as well as a possible coal chute, just 0.1m beneath present ground surface. Further structures and deposits were found to underlie these features (Eyre-Morgan and Morgan 2021, Figure 1, Plates 8-12).

The assessment concluded that the proposed development would have a direct impact on two heritage assets: Hafod Powerhouse/Boilerhouse (GGAT08261, Plates 1-7) and Revetment Wall (GGAT08258w) that would require archaeological mitigation in the form of a Strip Map Record (SMR) of the development area.

The proposed development would have an impact on the setting of Morfa Powerhouse (LB11691) and the Hafod-Morfa Laboratory (LB11690), which could be minimised by the use of sympathetic materials. Depending on the design, the proposed development may also

impact upon the setting of the Weighbridge Office (GGAT08239w), Porters Lodge (GGAT08219w) and Morfa Entrance (GGAT08220w).

A full impact assessment for the Powerhouse redevelopment was undertaken by Rubicon Heritage Services Ltd in 2018 (Morgan 2018). The present report is a rapid assessment of the impact of the additional land-take only. It conforms to the Chartered Institute of Field Archaeologists' Standard and Guidance for a Desk-based Assessment (published 2014, revised 2020).

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1 Introduction

1.1 Project Background

- 1.1.1 Black Mountains Archaeology Ltd/ Archaeoleg Mynydd Du Cyf have been commissioned by GWP Architects, on behalf of City and County of Swansea Council, to undertake a rapid assessment for an additional area of land required for plant as part of the ongoing Powerhouse redevelopment at the former Hafod-Morfa Copperworks (2018/0837/LBC & 2018/0836/FUL). The proposed development area lies directly south of the Morfa Powerhouse (LB11691) in the location of the Hafod Powerhouse and Boiler Room (GGAT08261) (Figure 1, *Plates 1-7*).
- 1.1.2 Black Mountains Archaeology Ltd/ Archaeoleg Mynydd Du Cyf carried out an archaeological field evaluation in 2018, which included trenches targeting the Hafod Powerhouse Building (Trenches 1-3), in order to assess the extent of archaeological remains in this area (Eyre-Morgan and Morgan 2021). The investigations concluded that the level of survival was high, with *intact* quarry tiled floor surfaces, footings and machine bases, as well as a possible coal chute, surviving just 0.1m beneath the present ground surface. Further structures and deposits were found to underlie these features (Figure 1, *Plates 8-12*).

1.2 Objectives

- 1.1.1 The objective of the rapid assessment is to assess the potential direct, indirect and setting impacts on heritage assets of an additional area of land-take for a plant building, located immediately to the south of the Morfa Powerhouse (LB11691).
- 1.2.1 A full impact assessment for the development was undertaken by Rubicon Heritage Services Ltd in 2018 (Morgan 2018). The present report is a rapid assessment of the impact of the additional land-take only. It built upon this previous assessment, and also took into account Cambria Archaeology's 2002 site-wide archaeological appraisal (Cambria Archaeology 2002), and archaeological evidence and archive research gained from multiple investigations undertaken by Black Mountains Archaeology Ltd in the last three years (see Section 2.3). The report conforms to the Chartered Institute of Field Archaeologists' *Standard and Guidance for a Desk-based Assessment* (published 2014, revised 2020).

1.3 Methodology

- 1.3.1 The assessment reviewed the existing information pertaining to the Historic Environment based on a primary (50m radius) study area centred on NGR SS 66138 95139. A Historic Environment Record (HER) enquiry was submitted for an area encompassing all Copperworks' sites in the Lower Swansea Valley (GGAT Enquiry no. 6703, received 02/12/2021).
- 1.3.2 This assessment considered heritage assets identified during the previous impact assessment for the Powerhouse redevelopment, which was carried out Rubicon Heritage Services Ltd in 2018 (Morgan 2018). It also considered the results of a site-wide archaeological appraisal undertaken by Cambria Archaeology in 2002 (Cambria Archaeology 2002). Furthermore the assessment considered new archaeological evidence and archive research gained from multiple investigations undertaken by Black Mountains Archaeology Ltd in the last three years.

1.3.3 Statutory designated sites within the wider landscape were considered for the potential impact on setting and significance of designated sites in the wider landscape.

1.3.4 Important or historic hedgerows were assessed according to current legislation that details the following criteria:

- the hedgerow marks the boundary, or part of the boundary, of at least one historic parish or township; and for this purpose, “historic” means existing before 1850
- the hedgerow incorporates an archaeological feature which is (a) included in the schedule of monuments compiled by the Secretary of State under Section 1 (schedule of monuments) of the Ancient Monuments and Archaeological Areas Act 1979(7); or (b) recorded at the relevant date in a Historic Environment Record
- the hedgerow (a) is situated wholly or partly within an archaeological site included or recorded as mentioned in paragraph 2 or on land adjacent to and associated with such a site; and (b) is associated with any monument or feature on that site
- the hedgerow (a) is recorded in a document held at the relevant date at a Record Office as an integral part of a field system pre-dating the Inclosure Acts; or (b) is part of, or visibly related to, any building or other feature associated with such a system, and that system (i) is substantially complete; or (ii) is of a pattern which is recorded in a document prepared before the relevant date by a local planning authority, within the meaning of the 1990 Act, for the purposes of development control within the authority’s area, as a key landscape characteristic
- there are other criteria relating to rights of way and ecology.

1.3.5 Heritage assets are categorised according to the only values that are nationally agreed in the *Department of Transport/Welsh Office/Scottish Office Design Manual for Roads and Bridges. Formerly Vol. 11 Section 3 Part 2 (HA 208/07 Cultural Heritage) 2007, amended 2009 (DMRB 2007), as amended January 2020 LA 106 Revision 1*. A cultural heritage asset is an individual archaeological site or building, a monument or group of monuments, an historic building or group of buildings, an historic landscape etc., which, together with its setting, can be considered as a unit for assessment. Heritage assets are assessed according to the following criteria.

1.3.6 Understanding value is subjective beyond any statutory or registered designation and is based on the professional experience and knowledge of the assessor. Other factors do contribute to the overall assessment of value (and significance) of heritage assets and the assessment criteria below contributes to an overall robust assessment framework.

Value		Criteria
A*	Very High	International/National World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.

A	High	National	Scheduled Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
B	Medium	Regional	Designated or undesignated assets that contribute to regional research objectives.
C	Low	Local	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
D	Negligible	Local	Assets with very little or no surviving archaeological interest.
U	Unknown	Unknown	The importance of the resource has not been ascertained.

Table 1. Factors for assessing the value of heritage assets (after Table 5.1 DMRB 2009)

2 Background

2.1 Location, Topography and Geology

2.1.1 The former Hafod-Morfa Copperworks (NGR SS 66138 95139) is located approximately 4km north of Swansea city centre on the western bank 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 natural 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). However, today much of the development site is overlain with substantial deposits of industrial waste and redeposited subsoil that were deposited during the lifespan of the copperworks. This in turn has been overlain by demolition rubble following the 1960s-80s clearance of the site.

2.1.2 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).

2.2 Archaeological and Historical Background

2.2.1 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' (Cambria Archaeology 2002) is particularly helpful in understanding the archaeological potential of the remaining historic assets on the site.

- 2.2.2 Both Hafod and Morfa Works were established on green-field, 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 both initially leased. A long field boundary, shown on both maps, persisted as the boundary wall between the two sites. The Hafod copperworks were established in 1808-09 by the Cornish entrepreneur John Vivian (1750-1826) with his sons John Henry Vivian (1785-1855) and Richard Hussey Vivian (1775-1842). Later in 1835, a Cornish firm, Williams, Foster & Co., opened the Morfa copperworks on adjacent land.
- 2.2.3 John Vivian became a partner in the Cheadle Brass and Wire Company in around 1800, whose copper smelting works were at Penclawdd, to the West of Swansea. This marked the beginning of the Vivians' involvement in copper smelting in Wales. In 1808 he resigned from the Cheadle Brass and Wire Company to start his own company in partnership with his sons at Hafod, north of Swansea. The Hafod site chosen by Vivian 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. In addition, 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. The venture undertaken by Vivian and his sons was soon established as a major manufacturer of copper in Britain. Within ten years it was the second largest producer of copper in Britain, accounting for about 17% of national output and by the mid- 19th century was the largest copper works in the world.
- 2.2.4 The Hafod site continually modernised, changed and expanded, with a rolling mill being added to the smelters sometime in 1819 for making bars and plates from copper ingots. Facilities were constantly improved over the course of the century, to enable the works to increase output and adopt improved technology. The prime obstacle became the lack of available land on which to maintain this expansion program, with the site becoming increasingly cramped. Increased production led to an increased amount of waste that needed to be disposed of. Eventually, in 1865, with construction of a new tram road, the company was able to transport the waste slag over the canal to the west, therefore releasing more areas for site development. The pressure created by the amount of waste slag was also partly eased by casting this waste material into usable blocks for building with. The company ceased smelting, and therefore the creation of slag waste, on site in 1904.
- 2.2.5 Work at Morfa began in 1828 with the construction of a rolling mill to process the ingots produced by the Rose Copperworks before adding its copper smelting facilities in 1834-5. The Morfa Copperworks became the largest non-ferrous metal smelter in the world by the mid-19th century, employing over 1000 people and supplying the Royal Mint with its copper. Michael Williams who, by 1861, had grown from leading partner in Williams, Foster and Co, to having almost complete control of the business until his death in 1880 when it was said he died the richest man in Cornwall.
- 2.2.6 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.

- 2.2.7 At least 15 or more significant structures, in varying degrees of condition, survive across the Hafod-Morfa Copperworks site. These include the former Morfa Rolling Mill (LB 16878), now used as a 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 west of the Vivian Engine House (LB 11696) and the Boundary Wall for the Hafod Copperworks canal docks (LB 16881) are also situated within the immediate vicinity, as well as the in-situ Musgrave Engine and Rolls (SMGm483) in the Musgrave Engine House and Chimney (LB 11697).
- 2.2.8 Previous investigations at the Hafod-Morfa Copperworks indicate that on the whole the level of survival of archaeological remains is high. The depth of the archaeology varies considerably from just 0.1m below the surface in the area immediately south of the Morfa Powerhouse (in the location of the proposed development) to a substantial 2m+ below the surface closer to the river, the latter a result of ground consolidation following the demolition of the works in the 1980s.

2.3 Previous Archaeological Investigations

- 2.3.1 2002 – a desk-based assessment was produced by GGAT for the Landore Park and Ride scheme. The assessment identified 21 extant buildings and the location of 14 demolished buildings associated with Hafod-Morfa Copperworks site (Locock 2002).
- 2.3.2 2002 – a site appraisal was produced by Dyfed Archaeological Trust in order to establish management plans for the identifiable heritage assets at the Hafod-Morfa Copperworks site (Cambria Archaeology 2002). The conclusions of this archaeological appraisal contributed to the baseline data for the present assessment.
- 2.3.3 2004 – an archaeological watching brief was undertaken by GGAT during the excavation of ground contamination test pits. A total of 18 test pits were excavated across the site of the copperworks. Some of the test pits confirmed a depth for natural on this site, whilst other test pits revealed solid structures (Wiggins 2004).
- 2.3.4 2004 – a building survey was undertaken by GGAT on a section of the Swansea Canal wall that was to be demolished to make way for a bus lane (Wiggins 2004).
- 2.3.5 2008 – a desk-based assessment was undertaken by Cambria Archaeology on the area of the Hafod-Morfa Copperworks. This assessed the current condition of all buildings and features on the site and revised the individual building management plan (Cambria Archaeology 2008).
- 2.3.6 2008 – an environmental impact assessment was undertaken by Cambria Archaeology for the Morfa Distributor Road which was intended to follow the line of the southern section of the Swansea Canal as it passes through the Hafod Copperworks (Dyfed Archaeological Trust 2008).
- 2.3.7 2013 – GGAT were commissioned by Swansea University to undertake a community archaeological excavation of the Hafod Copperworks. Three trenches were excavated: Trenches 1 and 2 were both abandoned as a result of contamination and Trench 3 was excavated to examine the approach to the works via the canal bridge to the main entrance (Halford & Sherman 2014).

- 2.3.8 2015 and 2016 – Rubicon Heritage conducted archaeological investigations ahead of the Morfa Distributor Road. A series of evaluation trenches in advance of the construction of the road was undertaken (Miller 2015) together with supplementary works (Pamment 2016).
- 2.3.9 2018 – a cultural heritage impact assessment was undertaken by Rubicon Heritage for the Powerhouse Redevelopment project. The assessment identified the potential direct and indirect impacts of the project on known heritage assets (Morgan 2018). The heritage assets identified in this report have been used as a baseline for the present assessment.
- 2.3.10 2018 - On behalf of Swansea University, Black Mountains Archaeology Ltd delivered a very successful community history and archaeology project at the world renowned Hafod-Morfa Copperworks. The Copperworks Discovery Project provided opportunities to get involved with historical and archaeological research workshops to explore the copperwork's past and on-site building survey workshops. The community project formed part of the wider regeneration project that aims to turn the renowned copperwork site into a world class heritage, innovation, and education destination. Further information can be found with this [link](#).
- 2.3.11 2018 – Black Mountains Archaeology Ltd conducted an archaeological field evaluation on three parcels of land within the copperworks area (Eyre-Morgan and Morgan 2021). Twelve evaluation trenches were strategically excavated across the site of the former copperworks in three defined areas, to achieve the most comprehensive understanding of the archaeological potential of the site. Trenches 1-3 (Area B) were targeted over the Canal Dock and the western end of the powerhouse/boilers of the Morfa works (the proposed development area); Trenches 4-6 (Area A) were targeted over the Long House furnaces (and calcining furnaces); Trenches 7-9 (Area A) were targeted over the Ore Yards and later buildings housing a Bessemer Converter; and Trenches 10-12 (Area C) were targeted to the south of the Rolling Mills and Gasworks. The results of the evaluation on the in revealed a layer of waste and debris overlying extensive archaeological remains of the former copperworks. The archaeological remains included: the floors and walls to various buildings, culverts, reverberatory furnace bases, machine bases and various foundation layers. The overlying debris and waste were the result of copper production and the demolition of the copper works.
- 2.3.12 2019 – Black Mountains Archaeology Ltd conducted a survey of timber design patterns found discarded in the basement of the Powerhouse (Lewis and Cook 2019). The basement floor of the Powerhouse building was cleaned and a 3D photogrammetric survey carried out to produce a comprehensive record of the timber design patterns for archival purposes and provide for further study and research. Many hundreds of pieces of timber were either too fragmentary, unidentifiable or in such degraded state that survey was impracticable. However, despite the challenges a total of 97 timber objects including 39 design patterns were recorded together with five fully measurable 3D photogrammetric models. The floor was composed of rectangular worn ceramic bricks, uneven in places due to subsidence. This floor was contemporaneous with the construction of the Powerhouse building but built over the back-filled pond, which may have been causing the subsidence

- 2.3.13 2019 – Black Mountains Archaeology Ltd were commissioned to carry out an archaeological watching brief at the Vivian Engine House (LB11695/NPRN33743), on the former Hafod-Morfa Copperworks site, Swansea, during ground contamination mitigation works (Langlands 2019). The work involved the excavation, removal and disposal of debris potentially containing asbestos from the interior and exterior of the structure. Items of architectural and heritage interest were photographed and recorded. Whilst the majority of the debris in both areas consisted of unstratified demolition rubble mixed with modern rubbish, a number of finds related to the Copperworks were recovered from the lower deposits within the machine pit. A large timber spanner board and a hammered copper bowl are the most notable finds, with an assemblage of copper working tools and brass weights also present. The exercise of debris removal presented a unique opportunity to record the architectural features within the basement floor of the Vivian Engine House. In particular the brick-lined wheel pit base and attached rope chamber, a brick-lined basement sump and a water culvert were uncovered, furthering our understanding of the building's development and function.
- 2.3.14 2019 – Black Mountains Archaeology Ltd conducted an archaeological field evaluation on the Silverstack Canal Bridge, Hafod-Morfa Copperworks and Smith's Canal, Whiterock Copperworks (Lewis and Langlands 2019). An open excavation (clearance) was carried out around the base of the demolished Silverstack Canal Bridge and five trenches machine excavated along the Smith's Canal followed by hand cleaning and recording. The investigations identified the remains of the Silverstack Canal Bridge abutments and the canal walls belonging to the Smith's Canal.
- 2.3.15 2019-2020 – Black Mountains Archaeology Ltd conducted an archaeological strip, map and record (SMR) of land to the south of Swansea Museum stores and west of the Powerhouse to inform on the nature and extent of any archaeological remains in advance of the construction of a whiskey distillery and visitor centre (Langlands et al. forthcoming). Among the principle discoveries were the remains of a large pond (labelled number 46 on historic maps) (Area 1), the well-preserved remains of an early 20th century bath house (Area 2) and the west and north walls of the Yellow Metals Mill Cast House within which were discovered a WWII air raid shelter and a series of early-19th century furnaces (Area 4). Further, a large culverted water filtration system was discovered to the north of the weighbridge office in Area 5. The remains of one of the early Morfa Rolling Mill buildings was recorded (Area 3), known to have burned down in 1840. A long-forgotten WWII memorial was revealed on the gable end of the surviving building. The east gable end of the original Morfa Laboratory building was found on the western edge of Area 3, along with a large stone and brick tunnel running from the corner of the Yellow Metals Mill Cast House to the Morfa Rolling Mill, likely to be an early walkway or tramway. Moreover, the remains of a reverberatory furnace was discovered in Area 3, within the footprint of the Yellow Metals Mill Cast House.
- 2.3.16 2020-ongoing – Following the SMR excavations described above, Black Mountains Archaeology is currently in the process of conducting post-excavation assessment and research towards the production of a post-excavation report (*ibid*). The research has enabled a detailed look at archival records including maps and plans, historic photographs and documentary sources held at the Swansea Museum Stores, National Museum Wales, the Richard Burton archives at Swansea University and the West

Glamorgan Archives. Key finds include the 1834-5 accounts of the construction of the Morfa Works, an 1894 plan of the Morfa Works and a large number of historic photographs dating as far back as the turn of the 20th century. These archives provide a rich source of information about the Hafod-Morfa Copperworks historic layout and development through time, as well as the function and fittings of individual buildings. The information gained from this research can inform future development on the site, such as the present assessment (Figure 2, Plates 1-8).

- 2.3.17 2020-ongoing – Black Mountains Archaeology Ltd is currently conducting an archaeological watching brief during the construction phase of the above-mentioned whiskey distillery and visitor centre (Morgan & Langlands forthcoming). Key discoveries include the remains of a reverberatory furnace towards the southern end of the Yellow Metals Mill Cast House, as well as a hot gas flue associated with the reverberatory furnace discovered during the SMR. Excavations to the east of the Morfa Powerhouse building uncovered a 19th century hot gas flue that was seen to run in a broadly E/W direction towards the large flue feeding into the Silverstack chimney. The remains of a series of 19th and 20th century buildings were also uncovered here which, according to a late 19th century plan of the works, may have been a series of workshops. Along the southern edge of the Morfa Powerhouse the remains of an incline tramway were uncovered, with a further section of in-situ tramrail observed to the east of the building. To the west of the Morfa Powerhouse, groundworks revealed the full depth of the large pond that predates the construction of the Powerhouse, as well as two brick relief arches within the western gable wall of the Powerhouse building. Excavations on the upper terrace uncovered the footings for a large Lancashire boiler, probably used in the 20th century to contain oil or fuel.

3 Assessment

3.1 Identified Heritage Assets

3.1.1 Within Development Area

- 3.1.2 Cambria Archaeology's 2002 archaeological appraisal of the Hafod-Morfa Copperworks identifies the location of the proposed development as having high archaeological potential (Cambria Archaeology 2002, p76-80). An excerpt from the appraisal is provided here showing identified heritage assets within the present study area:

"YIM 42- Revetment wall (SS 0615 9514) (GGAT08258w)

At the NE corner of the platform, adjoining the tarmac ramp alongside [the Morfa Powerhouse], are the fragmentary remains of a N-S retaining wall, now only 1.5m high. Only 2m survives, in squared Pennant freestone, forming a battered revetment glacis for the deposits to the west. It is clearly a primary feature of the site, retaining canal basin (YIM12). At its north end it curves around to the west, as a vertical wall alongside the tarmac ramp. To the south, any former revetment has gone and the deposits have been ramped back. The revetment is clearly shown on the 1943 plan, and to the south was a revetted ramp along which a railway line climbed from the lower part of the site to the terrace. The line is not shown on any earlier maps, when the revetment may have been continuous.

YIM 12 - Canal basin (SS 6611 9509) (GGAT08245w)

The body of the 1809 canal basin occupied the northern part of this area but was filled in during the late 1920s and has left no physical evidence on the ground.

YIM 36 - Building (SS 6613 9510) (GGAT08261) (Figure 1, Plates 1-7)

East of the basin site are two extensive, discrete areas of tile and concrete surfacing. They clearly represent the floors of YIM36, the powerhouse and boiler house that were established between 1899 and 1919. They were two large, parallel, rectangular N-S buildings, each measuring 20m by 10m, which supplied the works with electricity, and were served by a large chimney stack to the south, for which there is now no physical evidence. Electricity was supplied by two 300kw Sulzer engines and two Mather and Platt 600kw generators; a photo from the 1920s shows both buildings, in steel-frame and brick respectively, and the stack. They were enlarged in the 1930s, apparently at the expense of the stack. In the ramped section to the east can be seen the truncated remains of a brick wall, which appears to represent the end wall of one of the power house lean-tos.”

3.1.3 Black Mountains Archaeology Ltd/ Archaeoleg Mynydd Du Cyf carried out an archaeological field evaluation in 2018, which included trenches targeting the Hafod Powerhouse Building (Trenches 1-3), in order to assess the extent of archaeological remains in this area (Eyre-Morgan and Morgan 2021). The investigations concluded that the level of survival in this area was high. Quarry tiled floor surfaces, footings and machine bases, as well as a possible coal chute, were discovered just beneath the present ground surface (0.1m deep). Further structures and deposits were found to underlie these later features (Figure 1, Plates 8-12).

3.1.4 Within 50m Study Area

3.1.5 There are three Grade II Listed Buildings within the study area that may be subject to an indirect visual impact from the proposed development. These are Morfa Powerhouse (LB11691) located immediately to the north, Laboratory (LB11690) located 5m to the west and Tramroad Pier (LB11693) located 39m to the southwest.

3.1.6 Within the 50m (radius) study area there are a further three standing buildings; Weighbridge Office (GGAT08239w), Porters Lodge (GGAT08219w) and Morfa Entrance (GGAT08220w), all of which are in the process of renovation as part of the Powerhouse redevelopment project. Further heritage assets have been uncovered within the vicinity during recent archaeological investigations and have been found to survive in good condition beneath demolition material. The majority of these were already known to the Historic Environment Record (HER) but three are new sites.

3.1.7 Within Wider Site

3.1.8 Further Listed Buildings and Scheduled Monuments are located on the wider Hafod-Morfa Copperworks site including Morfa Rolling Mill (LB 16878), Musgrave Engine House and Rolls Scheduled Monument (SM Gm483, LB 11697), Copper Slag Abutment (LB 11692), Vivian Engine House (LB 11695), Chimney (LB 11696), Boundary Wall (LB 16881) and Lime Kiln (LB 11694).

Table 2. Identified Heritage Assets within 50m study area

ID	PRN	Name	X	Y	Period	Type	Designation	Value
01	LB11691, GGAT08088w	Morfa Powerhouse	266131	195156	Post-Medieval	Powerhouse	Grade II Listed Building	B
02	LB11690, GGAT02423w	Hafod-Morfa Laboratory	266100	195131	Post-Medieval	Industrial building	Grade II Listed Building	B
03	LB11693, GGAT02992w	Hafod Tramroad Pier	266108	195082	Post-Medieval	Tramroad Pier	Grade II Listed Building	B
04	GGAT08258w YIM42	Revetment wall	266150	195140	Post-Medieval	Wall	None	C
05	GGAT08245w, YIM 12	Hafod Canal basin	266110	195090	Post-Medieval	Canal basin	None	C
06	GGAT08261, YIM36	Hafod Powerhouse/ Boilerhouse	266130	195100	Post-Medieval	Industrial building	None	C
07	GGAT08219w	Porters Lodge	266089	195148	Post-Medieval	Office	None	C
08	GGAT08239w	Weighbridge Office	266085	195158	Post-Medieval	Office	None	C
09	GGAT08238w	Morfa Canal basin	266094	195157	Post-Medieval	Canal basin	None	C
10	GGAT08242w	Morfa Cast house	266108	195170	Post-Medieval	Industrial building	None	C
11	GGAT08220w	Morfa Entrance	266089	195142	Post-Medieval	Gateway	None	C
12	GGAT08244w	Morfa Coaling Platform	266108	195170	Post-Medieval	Platform	None	C
13	New1	Morfa Pond	266130	195156	Post-Medieval	Pond	None	C
14	New 2, CH006	Morfa Bath house	266101	195161	Post-Medieval	Industrial building	None	C
15	New 3	Morfa Stores	266161	195151	Post-Medieval	Industrial building	None	C
16	LB16878, GGAT08091w	Morfa Rolling Mill	266066	195249	Post-Medieval	Industrial building	Grade II Listed Building	B
17	SMGm483, LB11697, GGAT08295w	Musgrave Engine House and Rolls Scheduled Monument	266176	194962	Post-Medieval	Industrial building	Scheduled Monument Grade II Listed Building	A
18	LB11692, GGAT02424w	Copper Slag Abutment	266108	195082	Post-Medieval	Abutment	Grade II Listed Building	B
19	LB11695, GGAT02426w	Vivian Engine House	266177	194983	Post-Medieval	Industrial building	Grade II Listed Building	B
20	LB11696, GGAT08090w	Chimney	266157	194986	Post-Medieval	Chimney	Grade II Listed Building	B
21	LB16881, GGAT08089w	Boundary Wall	266130	194940	Post-Medieval	Wall	Grade II Listed Building	B
22	LB11694, GGAT02425w	Lime Kiln	266090	194994	Post-Medieval	Lime Kiln	Grade II Listed Building	B

3.2 Assessment of Direct Impacts

- 3.2.1 The proposed development is located directly over the remains of Hafod Powerhouse/ Boilerhouse (GGAT08261 Figure 1, Plates 1-7). This was identified as an area of high archaeological potential by Cambria Archaeology in 2002 and archaeological trenching carried out in 2018 confirmed that the quarry-tiled floor of the building and associated structures remain intact beneath just 0.1m of topsoil (Figure 1, Plates 8-12). Whilst there are currently no detailed plans for the proposed development, it can be assumed that the direct impact to this heritage asset will be Very High. There may also be an impact to Revetment Wall (GGAT08258w), although the overall effect of this would be Low as this heritage asset continues well beyond the limits of the proposed development.
- 3.2.2 Depending on the depth of the footings for the proposed development there is the potential to disturb unknown archaeological features that are preserved beneath the surface archaeology. Any such features are likely to relate to the earlier phases of the copperworks and would therefore be considered a significant discovery.

3.3 Assessment of Indirect Visual and Setting Impacts

- 3.3.1 The proposed development would almost certainly have a significant visual and setting impact on the Morfa Powerhouse (LB11691) and the Hafod-Morfa Laboratory (LB11690) since its proposed location means that it would feature within the setting and key views of both Listed Buildings. It is difficult to assess the level of this impact without detailed plans of the proposed plant building, however the impact could be minimised through the use of sympathetic design and materials (e.g. masonry and slate) in order to retain the historic character of the setting.
- 3.3.2 The setting of the Porters Lodge (GGAT08219w), Weighbridge Office (GGAT08239w) and Morfa Entrance (GGAT08220w) may also be subject to a setting effect if the proposed development is substantial in size and/ or of unsympathetic design. All other heritage assets within the study area have been considered and it is concluded that the proposed development would not have any further impact than that already caused by the Powerhouse redevelopment project.
- 3.3.3 Providing the proposed development is of sympathetic design it is considered that there would be no setting impacts to statutory designated sites in the wider landscape due to these sites being too distant and/ or having no direct intervisibility with the proposed development.

4 Mitigation Recommendations

- 4.1.1 The development area contains two heritage assets that are subject to potential direct impacts and therefore require mitigation. It is recommended that the most efficient means of mitigation would be an archaeological Strip Map Record (SMR) to the lowest construction level prior to the commencement of groundworks.
- 4.1.2 Targeted excavation of individual footings in the form of an archaeological watching brief could be an alternative approach depending on the complexity of the proposed design. It is advised that this option carries a higher risk, namely that if a significant discovery is made, more extensive excavation may be required that could cause considerable delay to the construction programme.

- 4.1.3 A sympathetic design in terms of form and materials (e.g. masonry and slate) is recommended to minimise visual and setting impacts on Morfa Powerhouse (LB11691) and the Hafod-Morfa Laboratory (LB11690) and may even be beneficial. This would also reduce the setting impact to Porter's Lodge (GGAT08219w), Weighbridge Office (GGAT08239w) and Morfa Entrance (GGAT08220w), and avoid visual and setting impacts to statutory sites in the wider landscape.

5 Residual Impacts

- 5.1.1 Providing that the mitigation recommendations above are followed, the potential direct impact to heritage assets will be reduced to None.
- 5.1.2 There would remain a residual impact to the setting of the Morfa Powerhouse (LB11691) and the Hafod-Morfa Laboratory (LB11690), however a sympathetic design could be beneficial.
- 5.1.3 A sympathetic design would reduce the potential impact to the setting of the Porters Lodge (GGAT08219w), Weighbridge Office (GGAT08239w) and Morfa Entrance (GGAT08220w), possibly to None. It would also reduce the potential visual and setting impacts to statutory designated sites in the wider landscape, possibly to None.

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7 Appendices

7.1 Appendix I: Figures

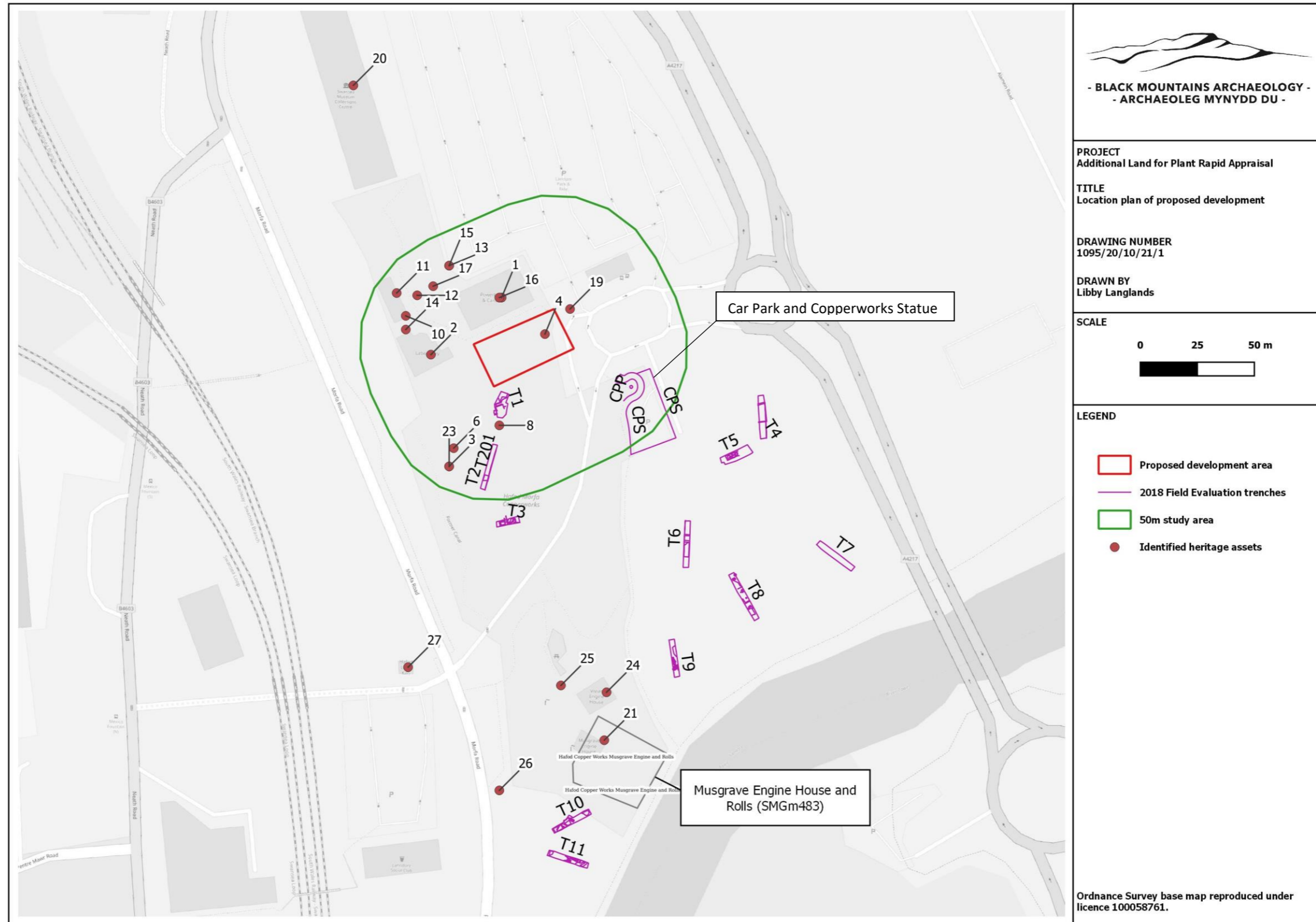


Figure 1. Location Plan of Proposed Development



Figure 2. Plan of Proposed Development Area overlying 1951 ICI Plan © Swansea Museum Service

7.2 Appendix II: Plates



Plate 1. Landore Power Station Building, 1910 © West Glamorgan Archive Service (D/34/5)



Plate 2. Landore Power Station Building, 1910 © West Glamorgan Archive Service (D/34/5)

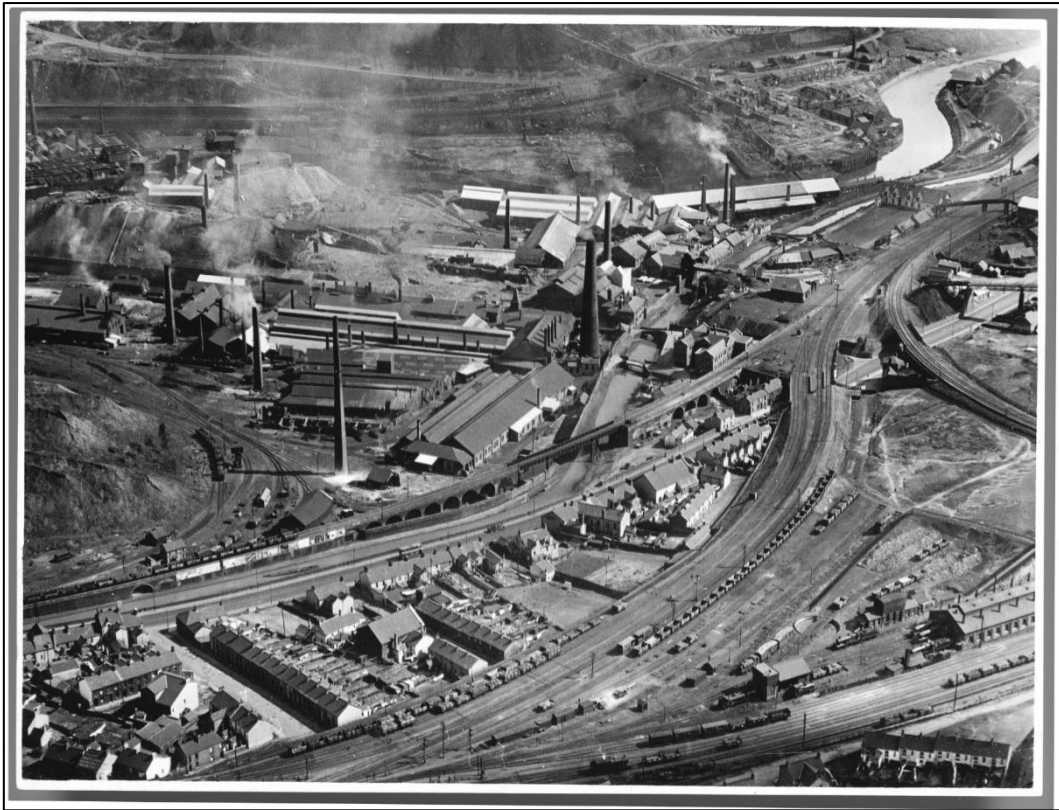


Plate 3. 1920s Aerial photograph of Hafod-Morfa Copperworks, Surrey Flying Services © Swansea Museum Service



Plate 4. New Main Office Block, Landore [with Powerhouse behind], 1968 © West Glamorgan Archive Service (D/34/5)



Plate 5. Landore Works, 1968 © West Glamorgan Archive Service (D/34/5)

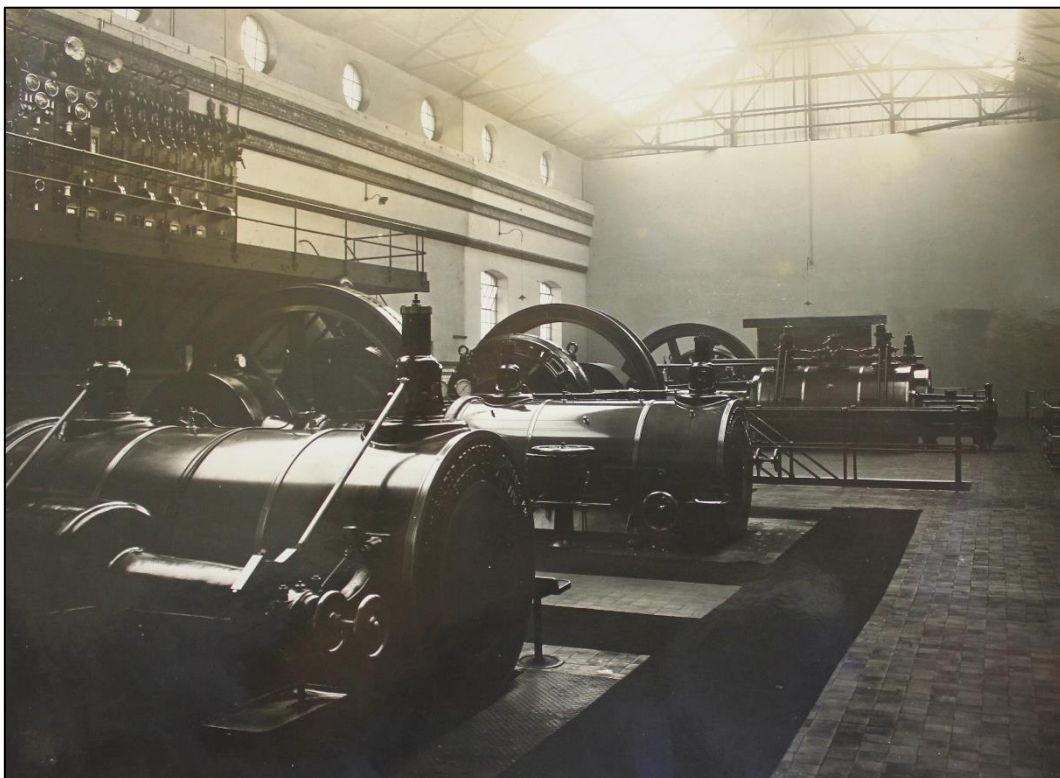


Plate 6. Power Station, Hafod Works. Built 1910, photograph taken 1920. West Glamorgan Archive Service (D/34/5)

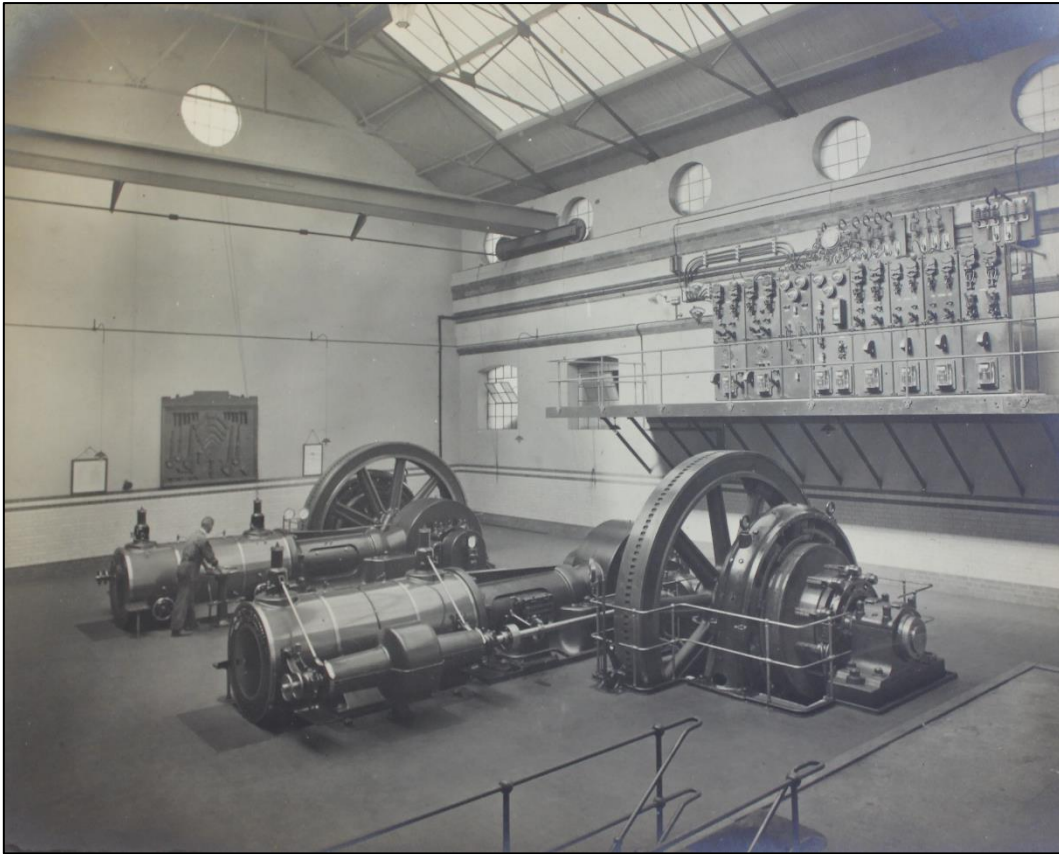


Plate 7. 300KW D.C. Generation 460 volt DC – with Sultzer Uniflow Steam Engine, 1910 installed © West Glamorgan Archive Service D/34/5

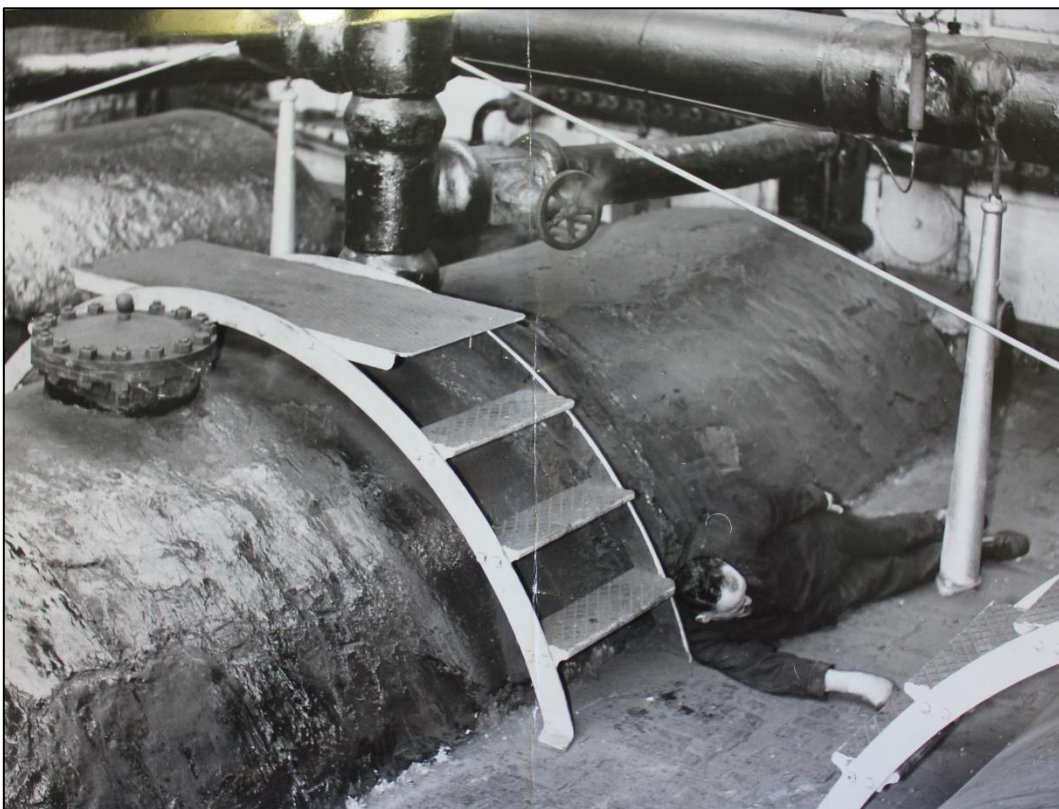


Plate 8. Work accident/ injury reconstruction, Boiler House, Hafod © West Glamorgan Archive Service (D/34/5)



Plate 9. Concrete [101], tiled floor [102] and concrete plinth [104] in Trench 1 (view west) (Eyre-Morgan and Morgan 2021)



Plate 10. Tiled Floor [102] in Trench 1 (view northeast) (Eyre-Morgan and Morgan 2021)



Plate 11. Floors [101] and [102], plinth [104] and walls [108] and [110] in Trench 1 (view north) (Eyre-Morgan and Morgan 2021)



Plate 12. Wall [109] and concrete structure [115] in Trench 1 (view northwest) (Eyre-Morgan and Morgan 2021)



Plate 13. Concrete slab [117], platform [118] and wall [110], forming possible coal chute in Trench 1 (view west) (Eyre-Morgan and Morgan 2021)



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As part of our desire to improve our quality of service we welcome any feedback you are able to provide.

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