Abererch Tidal Flood Defences
Pwllheli

An Archaeological Record
2005

GAT Project No. 1895
Report No. 613
October 2005

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust
Craig Beuno, Ffordd y Garth, Bangor, Gwynedd, LL57 2RT

ARCHAEOLOGICAL RECORD (G1895): ABERERCH TIDAL FLOOD DEFENCES PWLLHELI (G1895)

AN ARCHAEOLOGICAL RECORD

CONTENTS

ABERERCH TIDAL FLOOD DEFENCES, PWLLHELI

ARCHAEOLOGICAL ASSESSMENT (G1895): ABERERCH TIDAL FLOOD DEFENCES, PWLLHELI

SUMMARY

An archaeological assessment has been undertaken in advance of improvement work to be carried out on the downstream side of the Afon Erch tidal bridge. The proposed scheme will have a minimal effect on the current design and appearance of the bridge as only the tidal doors are to be replaced. The structure of the bridge will remain the same with only minor modifications made to the central pillar supporting two of the tidal doors. A new access platform will also be built. Overall, the character of the bridge will remain unchanged and the local area will not be altered. A watching brief during any major groundworks would enable a closer inspection of the local river silts that may contain evidence of shoreline activities and would also enable a closer inspection of the currently inaccessible tidal gate archways.

1 INTRODUCTION

Gwynedd Archaeological Trust has been asked by the Environment Agency for a desktop study and photographic record of the tidal doors on the Afon Erch where the river enters Pwllheli Harbour (SH381354). The tidal doors in current use are to be replaced, along with their fixings due to their poor condition. The central pillar supporting two of the four doors will be slightly modified to accommodate the replacement doors and fixings, whilst supplementary improvements will be made to the masonry pointing above the doors and a new access platform will also be added to accommodate maintenance work. The overall design of the tidal bridge will not be affected and neither will the penstocks on the upstream side of the bridge.
The area affected is shown on Environment Agency Drawing No. WNERCH/030/301 dated August 2005

2 SPECIFICATION AND PROJECT DESIGN

The basic requirement was for a desktop study and a photographic survey of the proposed area, in order to assess the impact of the proposals on the archaeological features within the area concerned. The importance and condition of known archaeological remains were to be assessed, and areas of archaeological potential and new sites to be identified. Measures to mitigate the effects of the construction work on the archaeological resource were to be suggested.

Gwynedd Archaeological Trust's proposals for filling these requirements were as follows:

- Desktop study
- Photographic survey
- Report

3 METHODS AND TECHNIQUES

3.1 Desk top study

This comprised the consultation of maps, documents, computer records, written records and reference works, which form part of the Historic Environment Record (HER), located at GAT, Bangor, as well as the consultation of secondary sources and an inspection of the on-line National Monuments Record *CARN*.

3.2 Field Survey

The field search was undertaken on 20th October 2005, when the site was visited and examined.

3.3 Report

The available information was synthesised to give a summary of the archaeological and historic background of the immediate area and a photographic and written description of the tidal gates.

4 ARCHAEOLOGICAL RESULTS

4.1 Topographic description

Pwllheli is situated on the southern coast of the Llyn peninsula at the confluence of the rivers Rhyd-Hir, Penrhos and Erch and is a natural harbour. The site is located on the northeastern side of Pwllheli below the Allt Fawr rock outcrop, south of the current A497 and north of the railway line, where the Afon Erch reaches Pwllheli harbour. The tidal gate is part of the Glan-y-Don embankment built during the early nineteenth century to protect Morfa Abererch to the east from extensive flooding. The area surrounding the embankment has been reclaimed and modernised with industrial outlets to the east and a marina to the west. The north side of the tidal bridge leads directly to the junction with the A497, whilst to the south is a privately owned garage.

4.2 Archaeological and historical background

4.2.1 Prehistory/Roman

There are no prehistoric or Roman sites within the vicinity of the site, though a Bronze Age adze and an Iron Age spindle whorl were recovered from Carreg Imbill to the south and a Bronze Age standing stone was identified in Morfa Abererch.

4.2.2. Early Medieval to sub-medieval

Pwllheli was the administrative centre of the commote of Cafflogion and gradually developed into a town and port. The original location of the medieval centre is unclear but it was thought to be towards the northern limits of the current town. There are no early Medieval to sub-medieval sites within the vicinity of the study area.

4.2.3 Early-Modern/Modern

Prior to the early nineteenth century, Pwllheli was a small harbour that traded in agricultural produce, coal and fish. The first major construction built for sea protection was a quay at Traeth Ty-Eiddew in 1808, located in the northwestern part of the town known as Corporation Marsh, which had previously been at the mercy of the sea. This was followed by large scale land reclamation in response to the 1811 Enclosure Act , which opened up common land for development. A long embankment was built between the southern end of Penlan Street and Bwlch-y-Tywod and a short embankment between Allt-Fawr and Glan-y-Don. The tidal gates were built into the embankments to restrict the flow of the flood tide and regulate the discharge of the rivers into the harbour. A tidal gate was built at the mouth of the Rhyd-Hir river at the northern end of the Penlan Street embankment and another at the northern end of the Glan-y-Don embankment at the mouth of the Erch river to protect the common land of Morfa Abererch. The scheme was begun in 1813 and took a year to complete. By virtue of this 1811 Act, the town secured seven new public roads, including the Cob and Yr Ala Uchaf. Provision was also made for a backwater, Y Pwll Du, on the western side of the embankment, a stone quarry (Garreg Fach) on the western side of Gimlet Rock, and an open space, Y Maes, for fairs and markets. A new road was also built *c*.1815 (but not under the 1811 Act) along the foot of the Allt Fawr to Abererch (part of the modern A497).
The Cambrian railway reached Pwllheli in 1867 via Morfa Abererch but a terminus was built at the Glan-y-Don embankment, south of the tidal gates and the train did not continue across the harbour to the western embankment until after the South Beach was developed in the late nineteenth century. The Cambrian Railway was finally extended into the town in 1909, terminating north of the Rhyd-Hir tidal gate. Prior to that, a local tramway ran along the western embankment. Further reclamation continued throughout the twentieth century and a marina was opened in the late 1980's on the west side of the harbour following dredging.

The tidal gates at Afon Erch and Rhyd-Hir are not listed on any maps until the 2nd Edition Ordnance Survey Map of 1900, but they had been in use since *c*.1814. The 2nd Edition Ordnance Survey Map shows a small square building to the immediate south of the Afon Erch tidal gates, but the building is no longer extant on the 1976 Ordnance Survey County Series Map.

4.3 General Description

4.3.1 The Tidal Bridge

The tidal bridge comprises a northwest to southeast aligned stone-built structure spanning the River Erch at the northern end of the Glan-y-Don embankment. The structure measures 12.5m in length, 10.0m in width and 6.0m in height (including the metal parapet). The structure is built from rectangular blocks of quarried stone, stretcher bond, with a lime-rich white mortar. A pillar runs through the centre of the bridge, 1.80m wide, which separates two archways, both 4.40m wide and 3.39m high that run through the bridge. On the upstream side of the bridge, each archway is covered by a wooden penstock *c*.4.5m high and 4.5m wide that are manually risen. On the downstream side of the bridge each archway is covered by a tidal gate built from planks of timber. Each gate incorporates two wooden doors that open outwards via metal hinges attached to stone pillars. Each door measures 2.25m wide and 3.50m high. The top of each gate is covered by a trapezoidal timber cowelling, 1.0m high and 4.5m wide. The top of the bridge has been modernised, with the stone courses at the top replaced by a concrete string course surmounted by a metal parapet/handrail. The penstocks and the upstream side of the bridge were modernised in the early 1980's.

In low tide the tidal gates open by downstream pressure from the river and are subsequently closed by the pressure from the incoming high tide. This prevents the high tide from flowing into the river.

The proposed scheme involves replacing the current dilapidated tidal doors and timber cowelling with newer versions. This will involve removing the current hinge fixings that are attached to the central and side pillars and a slight modification of the pillars to incorporate the new fixings. A new access platform will be constructed to the northwestern side of the bridge below the A497 and a safety fence will be constructed on the approaches to the bridge.

The penstocks will not be affected.

The Rhyd-Hir tidal gates to the west, built at the same time as the Afon Erch tidal gates and to a similar design, were modified in 2004.

4.3.2 Detailed Description of the Tidal Gates

As stated above, the tidal gates comprised a set of outward opening double doors individually hinged to stone pillars with a timber cowelling covering the archway. The design of the two doors were the same but the details were slightly different, suggesting evidence for repair. The construction of the archways could not be inspected as they were covered by the timber cowellings on the downstream side and by the penstocks on the upstream. An inspection of a series of drawings of the gates by Gwynedd Council in 1982 gives the dimensions of the arches, with the height of the arch of gate A standing at 3.88m and the arch of gate B at 4.03m. No information was given on the construction of the arches, i.e., whether they were segmental or the alignment of the stone voussoirs. The assessment of the Rhyd-Hir tidal gates in 2001revealed that the inside of the archways were built from vaulted stone; the same quarried stone used to construct the tidal bridge. Again, the cowelling covered the arch on the downstream side and the penstock did the same on the upstream side making an inspection of the entrances difficult (CAP Report No.204).

The northernmost gate, gate A, appeared to have the original timbers still in place. The cowelling comprised a trapezoidal timber frame, with the roof formed from two rows of six timber planks attached via iron nails to the central brace. It was not possible from the available viewpoints to inspect the cowelling from below to ascertain precisely the design of the frame used. Neither could it be ascertained how the cowelling was attached to the bridge as the joint was covered in render. Large oak timbers were used to form the cowelling frame, the two visible pieces were joined together by an iron brace that was fitted using bolts screwed into the wood. Both timbers had been reused as they contained redundant slots and holes, and one example may have been a central tie beam removed from a structure.
The tidal doors were attached to large metal hinges, socketed through the wood. The hinge a was retained at the top by a U-shaped bar screwed into a metal plate and attached to metal sockets set into the stone pillar. The design of the metal socket for hinge b was slightly different to that of hinge a in being barrel shaped rather than rectangular shaped. The metal sockets were attached to a metal plate secured to the central pillar. (Further inspection was hampered by overgrowth and lack of access). The doors were built from a rectangular timber frame with a cross brace and vertical timber panels. Iron bolts screwed the frame and panels into place. The doors were *c*.0.30m wide and a metal lanyard was attached to the top of each door, positioned in the centre. The purpose behind the lanyards was not clear but it was assumed they were previously used to hold open the doors by attaching rope to the lanyards and securing them to the pillars (as part of a flood control system). Wooden

doorstops had been set into the stone pillars, roughly halfway up. They were *c*.0.40m long and 0.20m wide and were designed to prevent the doors hitting the stone pillars.
The design of gate B was the same as gate A but the cowelling had been repaired: the original oak timbers on the frame had been replaced, as had some of the timber planks; the latter had been replaced by a wooden panel. There was no metal brace joining the timber frame and it was assumed that this repair work was recent (twentieth century). The doors were the same as gate A and did not appear to have been repaired. The metal lanyards were also in place. The design of the hinges were similar, although the U-shaped bars were not screwed into metal plates but attached directly to the metal sockets. The wooden door stops were also in place.

5 Conclusion

The tidal gates are a good example of an early nineteenth century flood control system and are part of a larger scheme also represented by the Rhyd-Hir tidal gates on the western side of Pwllheli. The tidal gates appeared to retain much of their original structure and design, although gate B had been repaired in the twentieth century. The tidal doors were original. The fixings for the hinges appeared uniform in design, although hinges b and d were partly obscured by overgrowth. The wooden frame of the cowelling on tidal gate A had been built from re-used oak timbers.

Due to the possibility of the existence of earlier embankments and sea defences and also the high potential for organic preservation of remains associated with shoreline activities, it is recommended that a watching brief take place during any major ground disturbance works associated with this modification, in order that any previously unrecorded archaeological features can be identified and recorded. Moreover, the removal of the timber cowelling and tidal doors would also facilitate a closer inspection of the tidal gate arches and any other masonry currently inaccessible, enabling a more detailed photographic record.

6 REFERENCES AND OTHER SOURCES CONSULTED

CAP Ltd. 2001. *Afon Rhyd-Hir Tidal Gates Pwllheli: Archaeological Desk-Based Assessment*. Report No. 204, Cambrian Archaeological Projects Limited, Llanidloes.

GAT 2005. *Ports and Harbours of Gwynedd: A Threat Related Assessment.* Report No. 577, Gwynedd Archaeological Trust, Bangor.

25" County Series Caernarfonshire XL.8 and XL.12 1900 and 1918

Gwynedd Council Contract Drawings of Existing Arch Dimensions at Afon Erch (Unpublished)

Figure List

Plate List

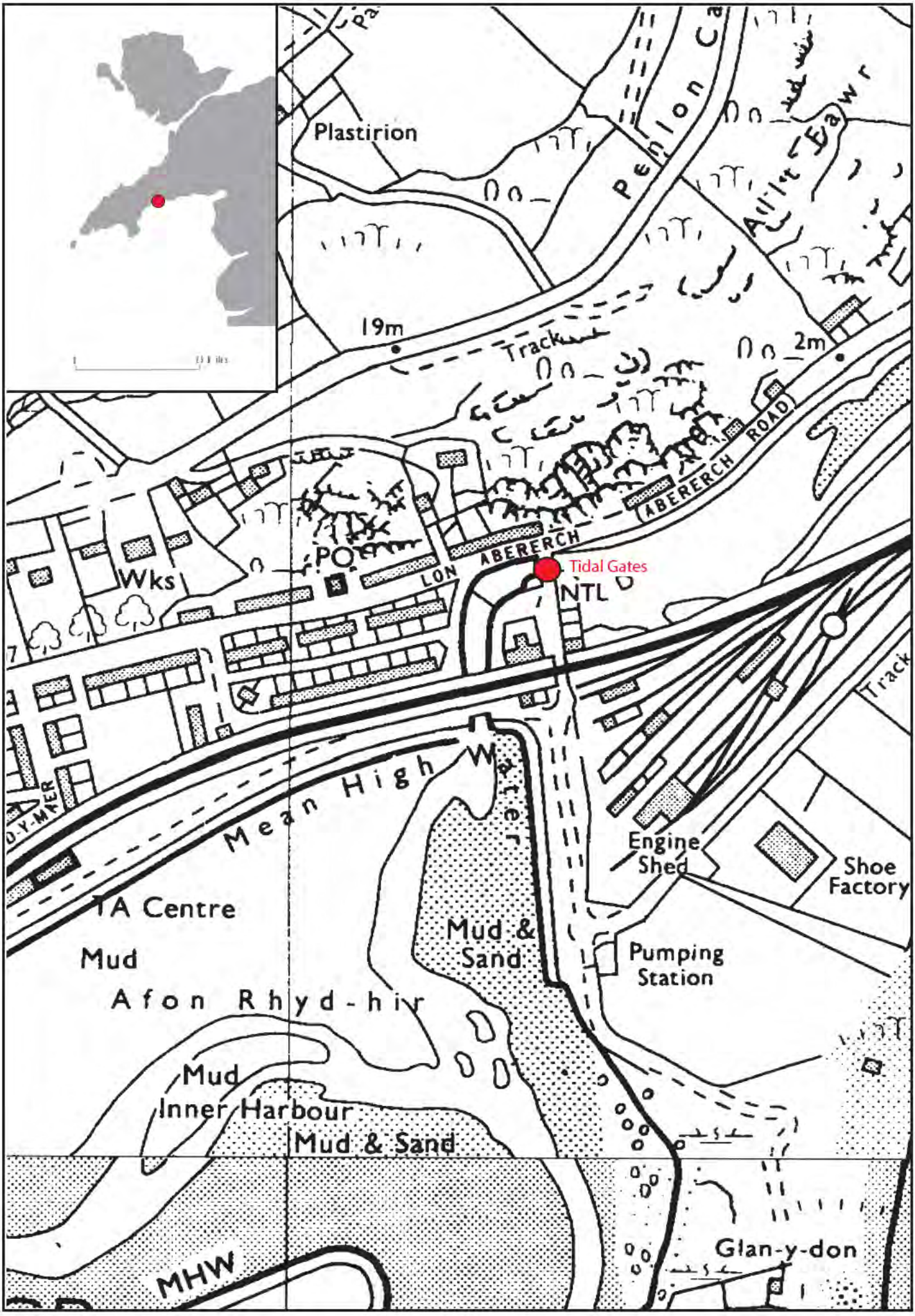

Figure 1. Site Location Map. Ordnance Survey County Series 1973, Caernarfonshire. (Scale 1, 2500)

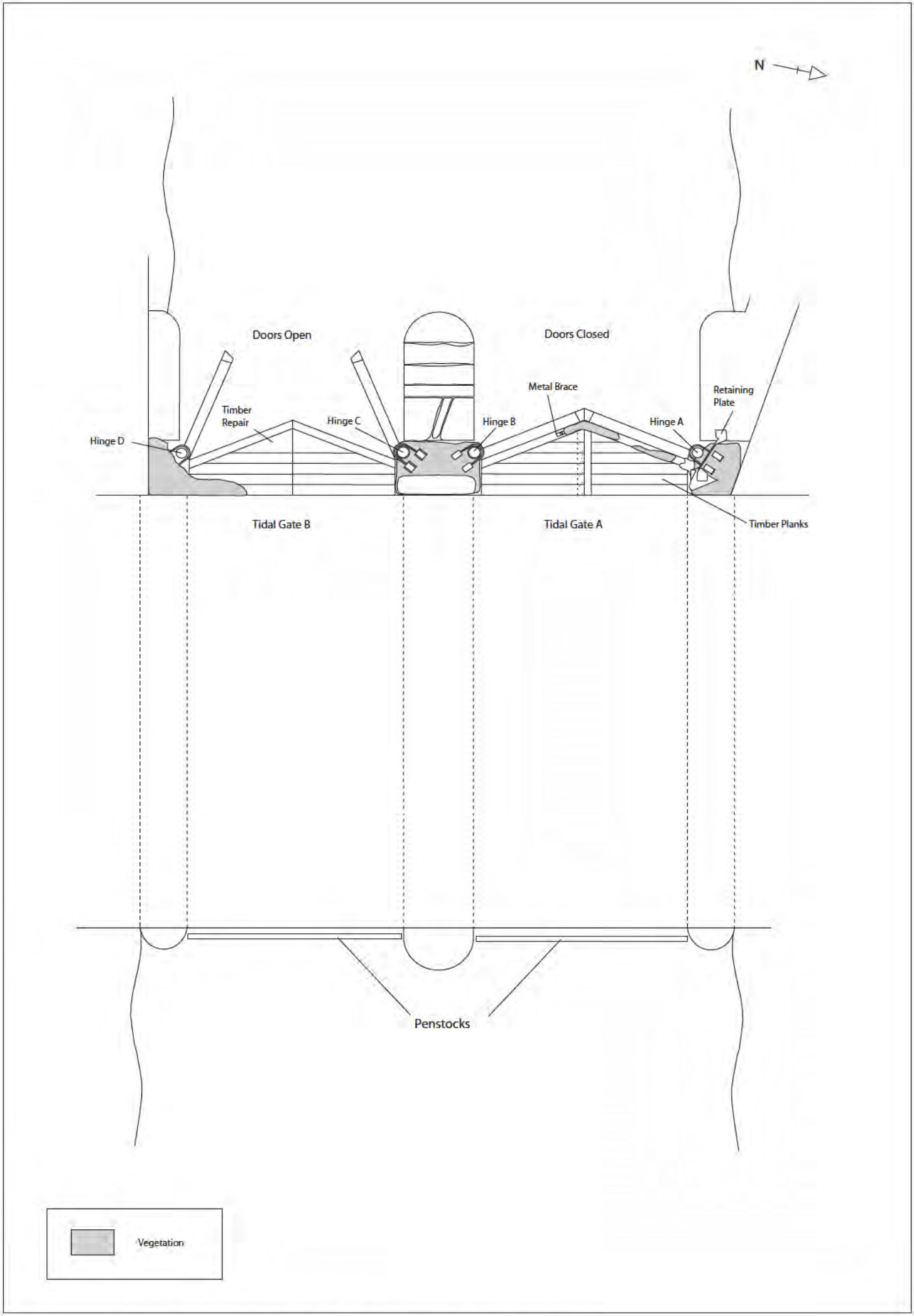

Figure 2. Plan of Abereich Tidal Flood Gates (Scale 1, 100)

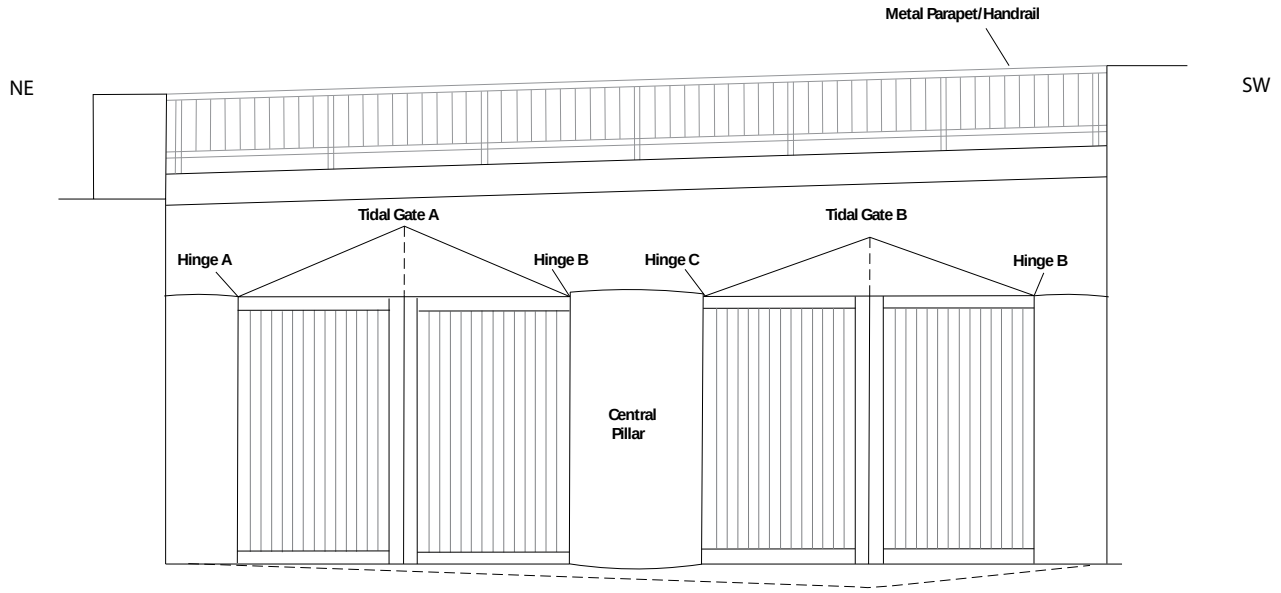

Figure 3. West Facing Elevation of Abereich Tidal Flood Gates (Scale 1, 100)

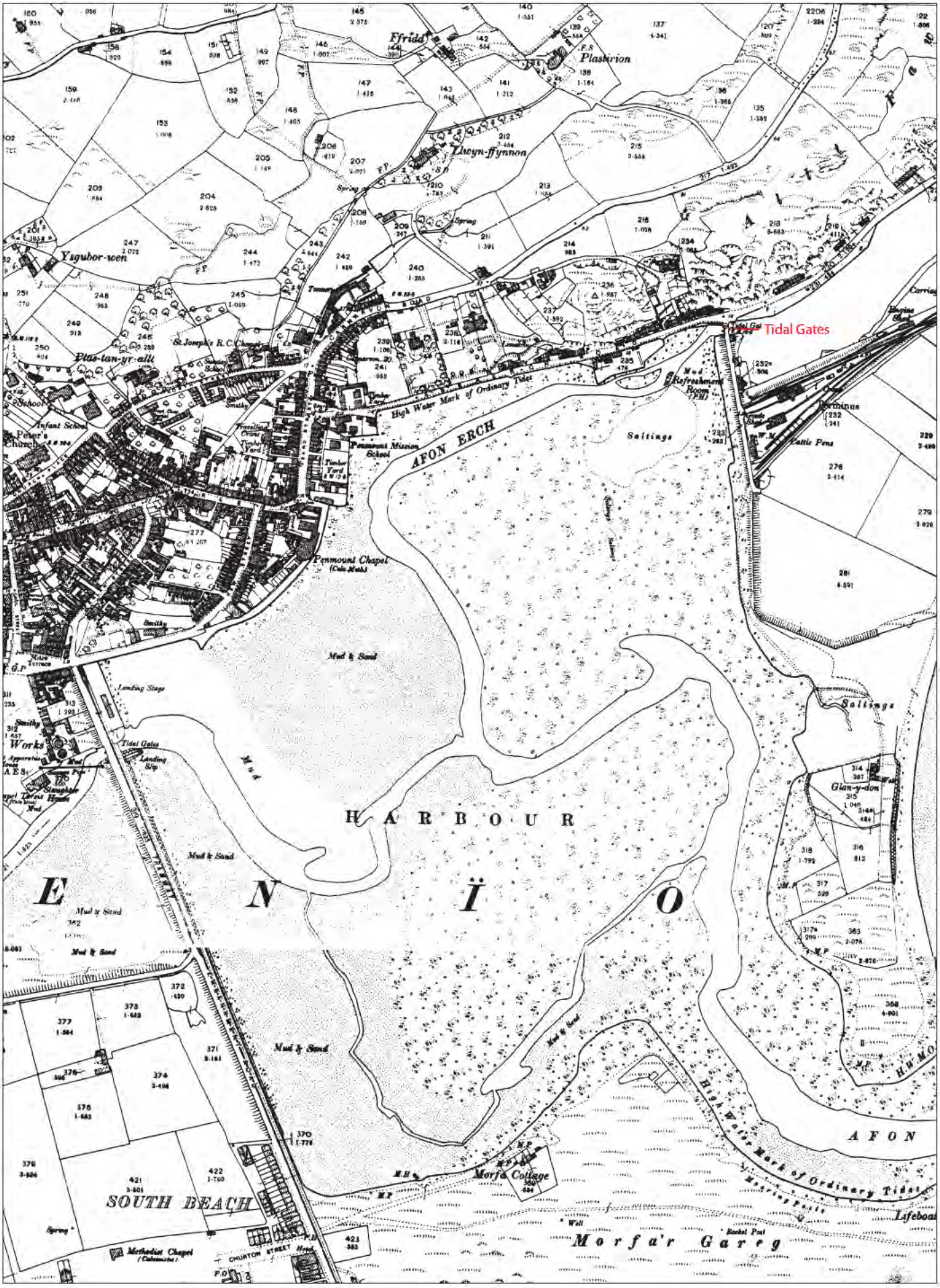

Figure 4. Pwhllheli Harbour in 1900. Ordnance Survey Sheet XL.8 and XL.12. (Scale 1, 4000)

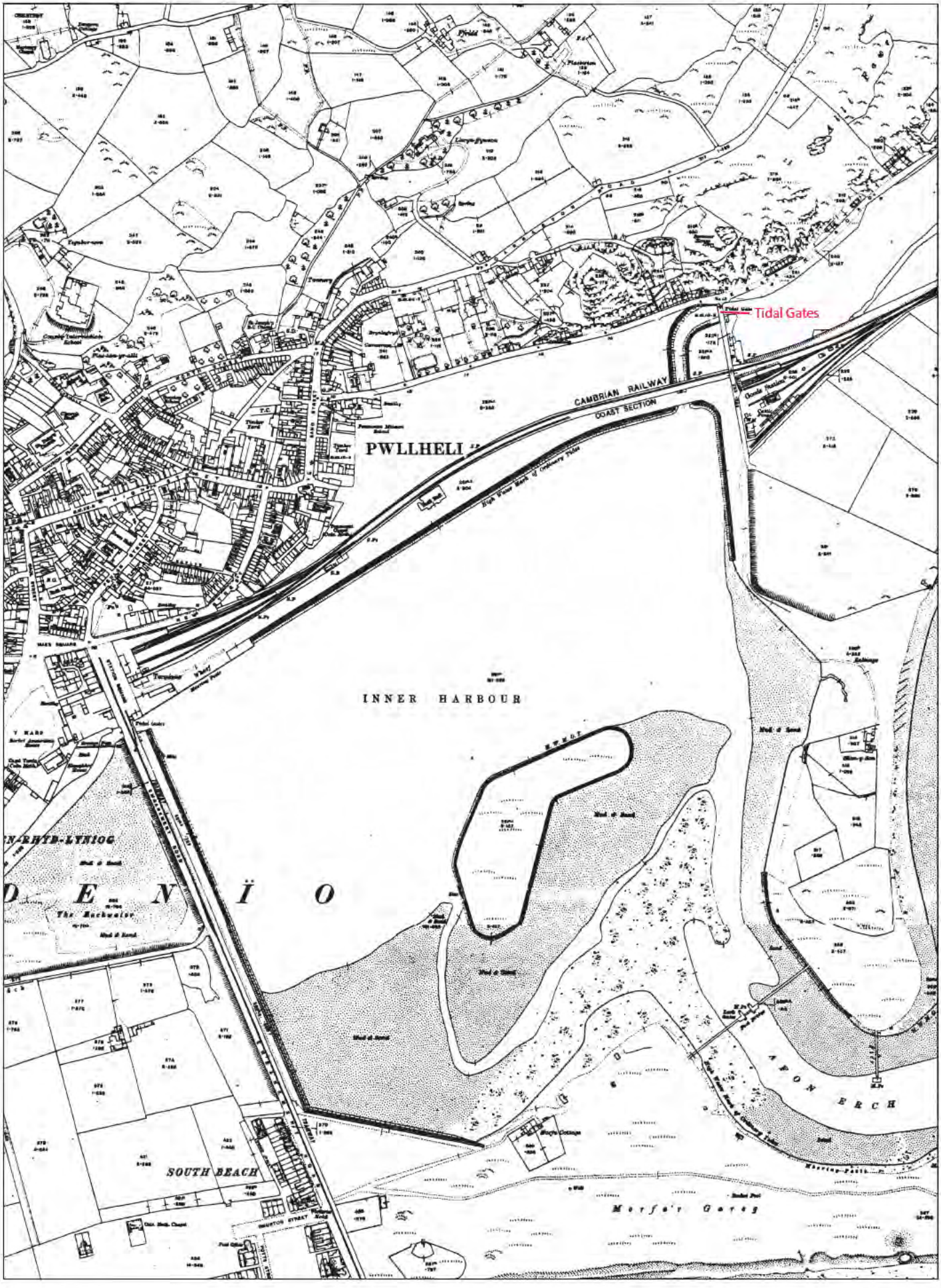

Figure 5. Pwhllheli Harbour in 1918. Ordnance Survey Sheet XL.8 and XL.12. (Scale 1, 4000)

Plate 1: Tidal Gates A and B Closed

Plate 2: Tidal Gates A and B Open (Tidal Gate B In Foreground)

Plate 3: Close-up of Tidal Gates Open (View from Northwest)

Plate 4: Close-up of Gate A Cowelling

Plate 5: Close-up of Reused Oak Timber on Gate A

Plate 6: Close-up of Cowelling and Bridge Structure Joint

Plate 7: Detail of Central Pillar

Plate 8: Close-up of Gate B

Plate 9: detail of Hinge a

Plate 10: Detail of Hinge b.

Plate 11: Detail of Hinge c

Plate 12: Detail of Hinge d

Plate 13: View of the Penstocks

Plate 14: Detail of Penstock Winding Mechanism

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Craig Beuno, Ffordd y Garth, Bangor, Gwynedd. LL57 2RT
Ffon: 01248 352535. Ffacs: 01248 370925. email:gat@heneb.co.uk