Archaeology Wales

Barmouth Viaduct, Abermaw, Gwynedd

Desk Based Assessment and Site Visit

By
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Report No. 1903

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Archaeology Wales

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Desk Based Assessment and Site Visit

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NON-TECHNICAL SUMMARY

In July 2020 Archaeology Wales was commissioned by Ecovigour to carry out an archaeological desk-based assessment and site visit to determine the archaeological/historic potential of the Grade II* Listed Building of Barmouth Viaduct and its surroundings. The site is located at Barmouth Bridge, Aberamffra Road, Barmouth, Gwynedd, LL42 1TB, and it is centred on NGR SH 62323 15022. The assessment has been undertaken during the consultation stage ahead of the proposed renovations of Barmouth Viaduct.

There are 129 recorded sites of archaeological interest within a 1km search area, and this includes 50 Listed Buildings and 2 Scheduled Monuments. The remaining sites comprise non-designated assets. The majority of the archaeological sites that have been considered in this assessment relate to the Post-Medieval period, and this correlates with the development of the Barmouth area in the late 19th and early 20th centuries.

The Registered Historic Landscape of Mawddach (HLW (Gw) 14) will be directly and indirectly impacted by the proposed development. The entire development area is located within this registered landscape. The direct impact will consist of the construction phase of the development.

CRYNODEB

Ym mis Gorffennaf 2020, comisiynwyd Archaeology Cymru gan Ecovigour i gynnal asesiad desg archeolegol ac ymweliad safle i bennu potensial archeolegol/hanesyddol Adeilad Rhestredig Gradd II Traffont Abermaw a'r tir o'i amgylch. Lleoliad y safle yw Pont Abermaw, Ffordd Aberamffra, Abermaw, Gwynedd, LL42 1TB, ac mae ei ganolbwynt yn NGR SH 62323 15022. Cynhaliwyd yr asesiad yn ystod y cyfnod ymgynghori cyn y gwaith adnewyddu arfaethedig ar Draffont Abermaw.

Ceir 129 o safleoedd cofnodedig o ddiddordeb archeolegol o fewn ardal chwilio 1km, ac mae hyn yn cynnwys 50 o Adeiladau Cofrestredig a 2 o Henebion Cofrestredig. Mae'r safleoedd sy'n weddill yn cynnwys asedau heb eu dynodi. Mae'r mwyafrif o'r safleoedd archeolegol a ystyriwyd yn yr asesiad hwn yn gysylltiedig â'r cyfnod Ôl-ganoloesol, ac mae hyn yn cyd-fynd â datblygiad ardal Abermaw ar ddiwedd y 19eg ganrif a dechrau'r 20fed ganrif.

Bydd Tirwedd Hanesyddol Gofrestredig Mawddach (HLW (Gw) 14) yn cael ei heffeithio'n uniongyrchol ac yn anuniongyrchol gan y gwaith datblygu arfaethedig. Mae'r ardal ddatblygu gyfan wedi'i lleoli o fewn y dirwedd gofrestredig. Bydd yr effaith uniongyrchol yn cynnwys cyfnod adeiladu'r gwaith datblygu.

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1. Introduction

1.1.1. In July 2020, Archaeology Wales (henceforth – AW) was commissioned by Ecovigour to carry out an archaeological desk-based assessment (henceforth –DBA) and site visit to determine the archaeological/historic potential of the Grade II* listed Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) and its surroundings subjected to development associated with restoration works. Barmouth Bridge, Aberamffra Road, Barmouth, Gwynedd LL42 1TB – NGR SH 62323 15022 (Figure 1).

1.1.2. The purpose of the proposed DBA is to provide Gwynedd Archaeological Planning Service (henceforth – GAPS), advisors to the local planning authority, with the information they are likely to request in respect of the proposed development, the requirements for which are set out in Planning Policy Wales (Ed.10, December 2018), Section 6.1 and Technical Advice Note (TAN) 24: The Historic Environment (2017). The work is to highlight and assess the impact upon standing and buried remains of potential archaeological interest to ensure that they are adequately preserved or fully investigated and recorded if they are disturbed or revealed as a result of subsequent activities associated with the development.

2. Site Background and Development Details

2.1.1. The proposed development is centred upon the restoration of Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096). The bridge crosses the estuary of the River Mawddach, leading the way for the Cambrian Coast Railway - Barmouth Bridge, Aberamffra Road, Barmouth, Gwynedd LL42 1TB – NGR SH 62323 15022 (Figure 1).

2.1.2. The viaduct was designed by Benjamin Piercy and then Henry Conybeare and opened in 1867. Since then it has been refurbished a number of times due to structural problems associated with the corrosion of its materials. The bridge is almost 700m in length and crosses an area of shifting sands underlaid by gravels and peat. The latter has the potential to have sealed archaeological remains of prehistoric date.

2.1.3. The proposed development also considers the creation of an access road to the SE of the development (see Figure 1) which would adjoin the site at the proposed compound location.

2.1.4. The underlying geology is defined as the Vigra Member and the Ffestiniog Flags Formation – mudstone, siltstone and sandstone – formed during the Cambrian Period. The superficial deposits are characterised as Tidal Flat Deposits of clay, silt and sand formed during the Quaternary Period (BGS 2020).

2.1.5. The proposed renovations include (Ecovigour 2020):

- Replacement of 2,394 structural timber members, including 124 main beams, 58 edge beams and 22 pedestrian walkway beams;
- The replacement of 50 piles & 64 crosshead timbers, corbels, with a new Glass Reinforced Plastic (GRP) to the Up-cess trackside maintenance walkway & new parapet hand railing.
- The replacement of associated stainless-steel straps and bolts plus other identified strap replacements.

- The replacement of concrete surrounds to piles riverside;
- Full longitudinal timber and rail replacement across the structure;
- New track guard panels at either end of the structure.

2.1.6. Phase I is due to commence in June/July 2020, and will include the necessary compound setup at Morfa Mawddach for use as office / welfare facilities, storage of required plant, machinery and materials, preparation works to the below bed level piles (installation of new gabion baskets within the existing reno mattress foundation around the existing piles), replacement of crosshead timbers and the rapid replacement of the piles using the previously installed of gabions during the first blockade. No works will occur within the designate site until formal accent has been granted by Natural Resources Wales.

2.1.7. The Phase 2 blockade is programmed for Sept to December 2021. This will include the replacement of vertical sections of the viaduct piers, replacement of concrete shrouds around the base of the piers and upper deck repairs/refurbishment. Demobilisation of all project assets is scheduled for January 2022.

3. Methodology

3.1.1. The assessment considered the following:

a) The nature, extent and degree of survival of archaeological sites, structures, deposits and landscapes within the study area. It has involved the following areas of research:

- Collation and assessment of all relevant information held in the regional HER, within a 1km radius from the centre of the proposed development area (Figure 2).
- Collation and basic assessment of the impact on all Designated archaeological sites (Scheduled Ancient Monuments, Listed Buildings, Historic Parks & Gardens, landscapes, Conservation Areas) within 1km from the centre of the proposed development area (Figure 2).
- Assessment of all available excavation report and archives including unpublished and unprocessed material affecting the site and its setting.
- Assessment of all extant aerial photographic (AP) evidence. This will include visits to Central Register of Air Photography for Wales, in Cardiff, CUCAP and Welsh Government Historic Aerial Photography WMTS.
- Assessment of archive records held at the County Archives, Bangor University, the Railway Museum and as appropriate, site files held by RCAHMW.
- Records held by the developer e.g. bore logs, geological/geomorphological information, aerial photographs, maps, plans.
- Examination of other known coastal deposits of archaeological interest situated along the Welsh coastline, particularly in the vicinities of the development.
- Map regression analysis using all relevant cartographic sources e.g. All editions of the Ordnance Survey County Series, Tithe and early estate maps (as available).
- Place name evidence.
- Internet sourced satellite imagery and LiDAR imagery as available.
- Assessment of the records held at the Portable Antiquities Scheme.
- Historic documents (e.g. Charters, registers, estate papers).

b) The significance of any remains in their context both regionally and nationally and

in light of the findings of the desk-based study.

c) The history of the site based on the areas of research outlined above.

d) The potential impact of any proposed development on the setting of known sites of archaeological importance (this will constitute a brief assessment, rather than a formal assessment such as that detailed in the Design Manual of Roads and Bridges). This will adhere to the setting assessment guidance (Stages 1-4) outlined in Cadw's Setting of Historic Assets in Wales (2017).

e) The potential for further archaeological remains to be present, which have not been identified in pre-existing archaeological records.

f) The potential for further work, with recommendations if requested and where appropriate for a suitable investigative and/or mitigation methodology.

4. The Results: Non-Designated Data (Figure 3)

4.1. An examination of the existing HER data within the 1km applied search area has retrieved 129 results. One HER – Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) – will be directly affected by the proposed development. A summary of the results is offered below following a chronological narrative.

4.2 Prehistory

4.2.1. Evidence for prehistoric activity predating the Neolithic is sparce, most possible due to the changing nature of the coastline in the area. However, the region is known to contain submerged peat areas which may hold the remains of activity dating to Mesolithic times. A few examples of this situation have been found containing flint flakes, picks, and antler tools (GAT HLC Barmouth).

4.2.2. The region does not contain the remains of Neolithic settlement, however, the presence of human activity during these chronologies is attested in the form of finds. In the Mawddach area Bronze Age burial sites appear concentrated in the south facing slope of Allt Llwyd and south of the Cregennan Lakes. These areas are linked by the Ffordd Ddu (GAT HLC Barmouth).

4.2.3. Within the search area, the HER documents three find spots: a quernstone (PRN 4174) found at Gwast at Agnes; a looped Bronze Age axe found at Braich-y-goes-wen, and a Bronze Age perforated hammer made of granodionite (PRN 4883).

4.3. Iron Age/Roman

4.3.1. The Mawddach area was not intensively occupied during these periods. We know of the existence of three hillforts in the area - Pared Cefn Hir and Craig Y Castell, and Llwyngwril at Castell y Gaer. It is known that the area did not have much arable land or other resources and was therefore a marginal area (GAT HCA Barmouth).

4.3.2. The examination of the HERs for the applied search area documents the presence of a possible hillfort Dinas Oleu (PRN 1140; NPRN 302781). This is described in the HER records as an oval enclosure measuring about 200m by 150m.

4.3.3. Roman activity is only attested by a findspot. This is a rotatory quern recovered at Arthog (PRN 4892).

4.4. Medieval

4.4.1. No medieval entries were recorded within the search area.

4.5. Post-medieval

4.5.1. Up until the 18th century Barmouth was a small fishing settlement. Shipbuilding began by 1750, and by the 1770 the port was central to some trades (e.g. woollen industry). These and other developments predating the 1800s (e.g. trade including coal, timber, limestone, corn and export of manganese, copper, lead) (GAT HLC Barmouth).

4.5.2. Communication and trade expanded with the deepening of the harbour, and the construction of a new quay in 1802, as well as the opening of the railway in 1867. On the other hand, the town gradually became a holiday-making destination. All these triggered the growth of the town giving its Victorian aesthetics which have remained to date. The HERs largely record the material remains of all the developments occurring during post-medieval times. These have been listed below:[1]

4.6. Railway

4.6.1. Five entries are recorded within the locality of Fairbourne relating to railway communication. These entries are all taken from Smith (2002):

- PRN 13914 refers to a tramway track bed used for horse-drawn tramways. The tramway runs from the quarry or Tyddyn Sieffre.
- PRN 13915 documents a stock ramps most probably used to load sheep and other stock into the Cambrian Railway.
- PRN 13916 records a wooden gate associated with the Cambrian Railway pedestrian route.
- PRNs 13920-21 details two trackways located near the estuary edge.

4.6.2. Two entries are located in Arthog:

- PRN 13919 refers to the Cambrian Railway track bed and embankment open in 1867 and nowadays used as a footpath.
- PRN 7272; NPRN 41329 document a railway station defined in the entry as a triangular junction station. Some elements e.g. platforms and walling have survived to date.

4.7. Religious structures

4.7.1. The HER search has documented a number of religious structures. These are listed below (note that those designated are listed in section 5):

- PRN 30509 documents Capel Horeb, first built as a congregational chapel for those working at Tyddyn Sheffrey Slate Quarry between 1863-5.
- PRN 63110; NPRN 8328 is nowadays a shop, however it originally was the Caersalem Chapel located in Barmouth.
-

[1] Designated assets form the bulk of the post-medieval entries. In order to avoid repetition these have been listed in Section 5.

4.8. Rural features

4.8.1. Multiple features were recorded by McGuiness (2014) on the Glastir Private Woodland Management Polygonisation, largely through identification during the examination of cartographic sources. The results are summarised below:

- The work identified a number of relict enclosures including PRN 8284, PRN57921 and PRN 57568.
- A number of sheep folds are also recorded: PRN 57902, PRN 57904 and PRN 57907.
- The work also identified multiple rural buildings largely marked in historic OS maps: PRN 57900, PRN 57901, PRN 57903, PRN 57905, PRN 57906, PRN 57909, PRN 57913-16, PRN 57920, PRN 57922, PRN 58163-4.
- Other features recorded include a pond (PRN 57588; NPRN 301728), a footpath (PRN 57854), a step (PRN 57588), and a well (PRN 57590).

4.9. Buildings

4.9.1. A large proportion of the buildings listed in the HER results are listed on section 5 as they are designated. However, there is a significant number of buildings that are known to exist/have existed thanks to the examination of historic maps (largely from the work of Burnett 2010).

4.9.2. A number of buildings have been identified in Barmouth in the OS County Series of 1889 including PRNs 12297, 28538 and 28540.

4.9.3. A number of buildings have been identified in Arthog in the OS County Series of 1889 including PRNs 30511, 30508, 30502, 30503. A number of buildings are also located in the OS County Series map of 1901 including PRNs 30506, 30507, 30505, 59653 and 59564.

4.10. Mineral extraction and associated

4.10.1. The search area documents a two manganese mines (PRNs 20577 and PRN 20583), as well as a slate quarry (PRN 20373) and two limekilns (PRNs 28539, NPRN 525440 and 70297, NPRN 525449).

4.11. Sea trade and communication

4.11.1. A number of PRNs are directly associated with the harbour. These are summarised below:

- PRN 19730 - Harbour Master's Office – was constructed sometime during the 19th century. The house is composed of a workshop and space for storage underneath. This 2-storey building is built with roughly coursed mortared stone with a set of external stairs to the first floor.
- PRN 19731 - Sailing Club – is a 3-storey building dating to the mid-19th century currently housing the Merioneth Yatch Club.
- PRN 19732 – Storage Sheds – built before 1889, nowadays used as storage for local business, however originally used by local fishermen.
- PRN 19733, NPRN 410396 - Sailor's Institute – was established by Canon Edward Hughes in 1890. Adjacent to St John's church, the building is a single storey currently in the process of refurbishment.
- PRN 19734 – the harbour – this entry corresponds to the former harbour. The remains of mooring rings still remain. The HER entry highlights that the area has

archaeological potential as it may contain the remains of former harbour works and boats.

- PRN 19736 – breakwater – built on Ynys y Brawd as part of the harbour resulting from the Harbour Improvement Act of 1797. Some of the remains still can be seen within the sand.
- PRN 29373, NPRN 308192 - Beacon, Ynys y Brawd – the location of the lighthouse in the island, it nowadays contains a beacon.
- PRN 7270 – Barmouth Harbour – the harbour darting to the 19th century contains some of the HERs recorded above. It comprises the harbour master office nowadays partly used as a museum, the Yatch Club and Ty Crwn. The houses around it are mainly boarding houses built between 1872 and 1878. As already noted, the harbour underwent repairing works after the Harbour Improvement Act was passed in 1797. While the present quay has been modified thought episodes of repair, it contains many of the elements defined during resulting from the Act.

4.12. Modern

4.12.1. Material remains of modern date within the applied search area are in keeping with the themes developed during post-medieval times (e.g trade and tourism). The records also include three hydro-electric structures – PRNs 67567-69 – and the material remnants of warfare. PRN 59743, NPRN 421536 refers to a pillbox constructed on the hillside, and PRN 13918 documents the Royal Marines training camp. The latter is constituted by a number of rectangular foundation platforms and other elements – including sentry boxes (PRN 13917), oil tanks walls and drains. The camp was built in 1941 and was demolished soon after WWII finished.

4.13. Portable Antiquities Scheme (PAS)

4.13.1. A search into PAS has retrieved two finds: a copper-alloy swivel strap fitting - GAT-C04F01 – and a pendant – HESH-78-CEA8 – all of post-medieval date.

5. The Results: Designated Data

5.1. Listed Buildings (Figure 4)

5.1.1. The development site is listed as a Grade II * structure (LB 5207).

5.1.2. 50 listed buildings have been recovered from the applied search area. Five structures are Grade II* and the remaining as Grade II. Except for LBs 5207, 15482-4, 15586 and 15591, all other buildings are located within the Conservation Area of Abermaw (see section 5.3).

5.1.3. Listed Buildings Glanafon (LB 15483) and The Clock House (LB 15484; NPRN 6575) are the only Listed Buildings that will be visually impacted by the proposed development during its stages of construction (Plates 7 and 40 – see impact assessment). Even though Abermaw Conservation Area is adjacent to the proposed development site, views from the high street towards the viaduct are obstructed by a promenade or bridge (Plate 66). Thus, the only listed buildings which have the potential to incur an indirect visual impact are those mentioned above.

Table 1. Listed Buildings in the search area

NUMBER	PRN	NPRN	NAME	GRADE
15450	63098		Tan Y Craig – 19th century cottage located in Cambrian Street within Abermaw Conservation Area. Alike to other structures within this street, it is rubble built and may have earlier origins.	II
15451	63099	406275	Graig Fach, 1 Church Street – 19th century 3-storey house located within Abermaw Conservation Area. The house follows the aesthetics characteristic of the street in which it is located.	II
15452	63100	406275	Graig Fach, 2 Church Street – 19th century 3-storey house located within Abermaw Conservation Area. The house follows the aesthetics characteristic of the street in which it is located.	II
15453	63101		Quay Cottage – located in Arthog, the structure has 17th century origins as well as a number of modifications dating to the 18th and 19th centuries.	II
15454	63102		Former Wash-House or Shop advanced to the R of Quay Cottage - storey rendered-rubble and slate building, probably a former wash house or shop.	II
15455	63103		Walsal House, Church Street – located within the main street of Abermaw Conservation Area, this building is probably early 18th century origins with a 19th century facade.	II
15456	63104		Cottage to the rear of Walsal House – the building is of 18th century date. The listing excludes the rear of the cottage.	II
15457			Fron Y Craig – High Street - 3-storey terrace range, originally of 3 houses, now converted to 2. Of dressed stone with a recently renewed slate roof with oversailing eaves. Located within Abermaw Conservation Area.	II
15458	63105		Tan Y Fron – High Street - An early 19th century terrace range retaining original doors and fenestration, located off the main street. Located within Abermaw Conservation Area.	II
15459	63106		Midland Bank, High Street - Located within Abermaw Conservation Area. Early 19th century, altered in early 20th century when converted to a bank building.	II
15460	63107		Estate Agents – High Street – coursed rough dressed building located within Abermaw Conservation Area. Defined as an early 19th century 3-storey terrace, the ground floor with 2 mid-Victorian shop-fronts under a contemporary covered arcade.	II
15461	6310	28304	Cors Y Gedol – Hight Street – located within Abermaw Conservation Area. Large inn/hotel of 2 adjacent blocks. It opened as an Inn in 1775, the first innkeeper being Mrs Lowry Lewis (d.1805). Rebuilt and extended by the proprietor John Robert Daviesc.1869.	II
15462	63109	30833	Aber House – High Street – located within Abermaw Conservation Area. A late Georgian house of 3 storeys. Of rough-dressed stone under a medium-pitched slate roof. Coped and kneelered gables with plain squat end stacks; 3 modern skylights.	II
15463	63110	8328	Discount World – High Street – located within Abermaw Conservation Area. A mid-Victorian 5-bay rectangular chapel with show-piece facade in eclectic Classical style. Built 1866 as the Caersalem Calvinistic chapel.	II
15464	63111		Morris and Co – High Street - A large drapers' shop with contemporary owner's house attached to the rear, built 1882-5; the shop was in use until the early C1970s and is almost entirely unaltered externally and internally. Located in Abermaw Conservation Area.	II*

15466	63113		Pen Y Crisiau – High Street – Located in Abermaw Conservation Area. A late 17th century house, perhaps originally consisting of three independent domestic units, one above the other.	II
15467	63114	43878	St John Church – St John Hill - St. John's Church was built at the inspiration of the Reverend Edward Hughes to the designs of John Douglas, architect of Chester.	II*
15468	63115	31944	Church Hall - Built in 1910; a gift of Mrs Williams of Plas Mynach (formerly Mrs Perrin, patroness of St. John's Church).	II
15469	63116		Tanyralt - Water Street - A small 2-storey early 19th century cottage, perhaps with earlier core. Located in Abermaw Conservation Area	II
15470	63117		Tanyrallt – structure located within Abermaw Conservation Area. It is a 3 bay, 3 storey house; rubble construction with slate roof.	II
15471	63118		Caprera Cottage – located within Abermaw Conservation Area, the cottage is one of the St. George's Guild Cottages and formed one of originally 13 units which formerly served a community founded by John Ruskin.	II
15472	63119		1 Pen Y Gribin - located within Abermaw Conservation Area, the cottage is one of the St. George's Guild Cottages and formed one of originally 13 units which formerly served a community founded by John Ruskin.	II
15473	63120		2 Pen Y Gribin - located within Abermaw Conservation Area, the cottage is one of the St. George's Guild Cottages and formed one of originally 13 units which formerly served a community founded by John Ruskin	II
15474	63121		2, St George's Terrace - The terrace forms two of the formerly 13 St. George's Guild Cottages which formerly served a community founded by John Ruskin. Located within Abermaw Conservation Area.	II
15475	63122		3 and 4 St George's Terrace - The terrace forms two of the formerly 13 St. George's Guild Cottages which formerly served a community founded by John Ruskin. Located within Abermaw Conservation Area.	II
15476	63123		5 St George's Terrace - The terrace forms two of the formerly 13 St. George's Guild Cottages which formerly served a community founded by John Ruskin. Located within Abermaw Conservation Area.	II
15477	63124		8 St George's Terrace - The terrace forms two of the formerly 13 St. George's Guild Cottages which formerly served a community founded by John Ruskin. Located within Abermaw Conservation Area.	II
15478	63125		2, St George's Terrace - The terrace forms two of the formerly 13 St. George's Guild Cottages which formerly served a community founded by John Ruskin. Located within Abermaw Conservation Area.	II
15479	63126		Pen Y Graig Ysa - A large late 17th century building with inverted J plan, apparently conceived from the outset as a complex of independent domestic units. Located within Abermaw Conservation Area.	II
15480	63127		Pen Y Graig Cottage - A large late 17th century building with inverted J plan, apparently conceived from the outset as a complex of independent domestic units. Located within Abermaw Conservation Area.	II
15481	63128		Gibraltar Cottage - A large late 17th century building with inverted J plan, apparently conceived from the outset as a complex of independent domestic units. Located within Abermaw Conservation Area.	II
15482	63129	408363	1 Anchorage View – two terraced houses of 19th century origins located to the east of Abermaw Conservation Area.	II
15483			2 Glanafon - two terraced houses of 19th century origins located to the east of Abermaw Conservation Area.	II
15484	6575		The Clock House - Eclectic Victorian Gothic house built by the Lowe family, mill-owners; the main, central section dates from c.1844, to which additions including a striking clock tower were added c.1890-1900. Located south of Coed Orielton.	II
15586	62946		Garth Y Fog - Small 2-storey vernacular farmhouse dated 1792. Located in Arthog.	II

15591	30510		Mile post - A second half 19th century cast iron milepost with triangular profile, located in Arthog and associated with the railway line.	II
4897	6577	28810	Ty Gwyn – located in Barmouth Harbour - Ty Gwyn yn Bermo' was built in the third quarter 15th century by Gryffydd Fychan of Corsygedol, a staunch Lancastrian and one of the principle supporters of Jasper Tudor, Earl of Pembroke.	II*
4898	13919	34149	Ty Crwn - located in Barmouth Harbour, built on the instructions of the county's magistrates as a lock-up for drunks and petty offenders.	II
4899	12312	28205	Anchor Cottage - A late 17th century house located north of Barmouth Harbour.	II
4900	12475	28755	Tan Y Grisiau - A late 17TH century house originally consisting of three independent domestic units, one above the other. Located within Abermaw Conservation Area.	II
4901	12388	28502	Tyn Y Coed - is a A late Georgian town house of c.1800 with Victorian alteration located within Abermaw Conservation Area.	II
4902	12299	28167	Nos 2 & 3 Bennar Terrace – late 18th century terrace located within Abermaw Conservation Area.	II
4903	12376	28446	Nos 1-4 Goronwy Terrace – 19th century terrace located within Abermaw Conservation Area.	II
4904	63094	28726	St George's Terrace - The terrace forms two of the formerly 13 St. George's Guild Cottages which formerly served a community founded by John Ruskin. Located within Abermaw Conservation Area.	II
4905	63095		Williams Buildings – 18th century terrace located within Abermaw Conservation Area.	II
4907	10297	28164	St Anne House - A large former Inn known originally as the Lion Inn. Located within Abermaw Conservation Area.	II
5204	6571	34920	Barmouth South – signal box built in 1890.	II
5207	7271	34918	Barmouth Viaduct – described below as it is directly affected by the proposed development.	II*
5245	19735	43866	St David's Church - Built in 1830 by Edward Haycock the elder, architect of Shrewsbury as the first church in Barmouth. Located within Abermaw Conservation Area.	II

5.2. Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) (Figures 14, 15 and 16)

5.2.1. Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) is central to this report as it will be directly affected by the proposed development. Particular attention has therefore been placed on its history of development and characteristics. The results of the research have been presented below:

5.2.2. The Grade II* viaduct crosses the estuary of the River Mawddach, leading way for the Cambrian Coast Railway. The latter connects the towns of Aberystwyth, Tywyn, Barmouth, Harlech, Porthmadog, Criccieth and Pwllheli (Gwyn and Williams 1996).

5.2.3. The construction of the railway was authorised between 1861-2 as the Aberystwyth and Welsh Coastal Railways merged (Johnson 2013). Benjamin Piercy was the chief engineer followed by Henry Conybeare. They designed the viaduct which opened in 1867 first for horse-drawn carriages and later on for locomotives. Thomas Savin was the contractor and the iron work was produced by John Cochrane and Sons. The use of timber over wrought iron was, in the words of Henry Conybeare (1871) 'entirely financial[2]'.

5.2.4. Architecturally, the bridge is defined as a single-track viaduct measuring 686m in length, comprising two main sections. A timber section with 113 pile supports, and a five-span steel section incorporating a steel lattice swing bridge (Hague 1984). The latter is not used for naval traffic and its movement is hindered by the installation of a continuous single track on top (Plate 15).

Reconstruction events and technical details – the northern end

5.2.5. The northern end was originally defined by a 14m drawbridge sustained by iron piles rolled on four wheels 15m apart and nine steel rollers (Figure 14.1). The most detailed description of this region of the bridge is offered by Henry Conybeare in 1871. In his article he notes the presence of two viaducts with opening spans, one being at Barmouth with an opening of 36 feet (c. 11m)[3].

5.2.6. The bridge fenders at this end were constructed using timber piles (14-inch square – 0.35m square) encased in a cast-iron splice at the top of each timber pike so it allows the full submersion of the pile into the channel bed (Conybeare 1871). The first two piles on the northernmost end were substantially different to all others as they rested on rock from Cader Idris. They were cylindrical and made of cast iron filled with concrete to high water mark. They were bedded by divers and filled with concrete (Figure 14; Plates 61-64) with a lot of difficulty as noted by Conybeare (1871) in his article while detailing a number of attempts to anchor these piles.

5.2.7. The roadway was supported by trellis girders. The drawbridge used for this construction was an over-drawbridge in which the roadway opening span was

[2] Note that timber was imported from existing trade with the Baltic. In his words 'Contractor brought the timber by sea direct from the Baltic, the ships being unloaded on the works, which rendered the cost of the material, as put into the works, exceptionally low'

[3] A depiction of the bridge as it stood by 1871 can be found at the National Library of Wales – link: http://hdl.handle.net/10107/1130935; a depiction of the bridge dating to 1869 can be found at the National Library of Wales – link: http://hdl.handle.net/10107/1133987

supported between two girders which dropped into position when the bridge was closed (Figure 14).

5.2.8. In 1899, during an inspection of the bridge it was noticed that the bracing support for the drawbridge was in poor condition and structurally unstable (Figure 14.1). Beside the piers all the iron work had to be replaced. The work began in 1899 and was completed in 1902 by the Cleveland Bridge and Engineers Co Ltd, transforming this section of the bridge as the swing bridge that has remained to date (Figure 15.1). The latter is defined by a 41m steel swing span rotating around a central pivot. The spans where reinforced by lattice trusses carried on pairs of cylindrical iron piers with four grouped together and acting as the swing mechanism. The last time in which the swing bridge was opened was in 1987 (Figure 16.1).

Reconstruction events and technical details – the timber pile viaduct

5.2.9. This area of the bridge was made of 113 wooden trestles. Unlike the area of the drawbridge, this area was characterised by shifting sands varying from 2 to 8 feet (0.6 to 2.43m) (Conybeare 1871). The sand overlaid a deposit of gravel which sat on top of a level of peat. By 1871 all the piles were defined as screw piles with screw discs located 8 feet (2.43m) up the pile. Each pile was 10 inches (0.25m) in the shallow portions of the channel and 14 inches (0.35m) in the deeper parts. The six piles of each pier were assembled in two groups, the uppermost forming a tripod for load bearing purposes. Further stability of the piles was accomplished by laying a deposit of stone around each pile and reinforcing the latter with cast-iron discs. Moreover, each pier was reinforced with diagonal braces.

5.2.10. Figures 14.1-14.3 documents the original construction techniques used for the piers. Between 1906 and 1909 the timber portion of the viaduct was also completely renewed in the same material by Mr Abraham Williams of Aberdovey (Figures 15.1-15.3). However, these works did not ceased movement through the bridge (Gasquoine 1922). A number of plans relating to this period of renovation have been included in Figure 15. [4]

5.2.11. In October 1980, the viaduct was closed to trains after it was noticed by divers that 500 timber trestle piles had been damaged by *Teredo Navalis.* This led to a period of extensive repairs where 48 piles were replaced with hardwood and another 330 piles were covered with cement and reinforced with glass-reinforced concrete jackets. The 1980s drawings (Figure 16) offer a great amount of detail on the history of reconstruction of the viaduct. Details explained in these drawings are summarised below:

- Piers 1 to 33 presented no evidence of work by the 1980s.
- Pier 34 had one pile spliced prior the 1980s.
- Pier 37 to 39 presented no evidence of work by the 1980s.
- Piers 40-45 were cased in the 1980s also adding a stone filled reno mattress.
- Pier 46 – same as above – but one pile was spliced in the 1980s. A stone filled reno mattress was added.

[4] Further research was not possible at the time of writing due to the closures of archives and other institutions associated with COVID19.

- Pier 47-49 were cased in the 1980s. A stone reno filled mattress was added.
- Pier 50 was cased and spliced in the 1980s. A stone reno filled mattress was added.
- Pier 52 was cased, and one pile was also spliced in the 1980s. A stone filled reno mattress was added.
- Pier 53 two piles were cased in the 1980s and two were cased and spliced in the 1980s. A stone filled reno mattress was added.
- Pier 54 all cased and two spliced in the 1980s. A stone filled reno mattress was added.
- Piers 55 – 57 all piles were cased and two spliced prior the 1980s. A stone filled reno mattress was added.
- Pier 58 all piles were cased and two spliced in the 1980s. A stone filled reno mattress was added.
- Pier 59 all piles were cased and one spliced in the 1980s. A stone filled reno mattress was added.
- Pier 60 – all piles were placed and spliced in the 1980s. A stone filled reno mattress was added.
- Piers 61-63 – all piles and two piles spliced prior the 1980s. A stone filled reno mattress was added.
- Pier 64 – all piers cased in the 1980s. A stone filled reno mattress was added.
- Pier 65 – all piers had been cased prior the 1980s. A stone filled reno mattress was added.
- Pier 65-69 – all piles cased prior the 1980s. Pier 69 had one pile also spliced. Stone filled reno mattress predating 1980s.
- Pier 70 – all piles cased prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 71 – all piles cased and one spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 72-74 – all piles cased prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 75- 76 - all piles cased and spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 77-79 – all piles cased prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 80 – all piles cased and two spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 81 – all piles cased and one spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 82 – all piles cased prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 83 – all piles cased prior the 1980s and one spliced. Stone filled reno mattress predating 1980s.
- Pier 84-86 – all piles cased and two piles of each pier spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 87 - all piles cased and three piles of each pier spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 88 - all piles cased and one piles of each pier spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 89 - all piles cased prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 90 - all piles cased and one pile spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 91-92 – all piles cased prior the 1980s. Stone filled reno mattress predating the 1980s.
- Pier 93 and 94 - all piles cased and two piles spliced prior the 1980s. Stone filled reno mattress predating 1980s.

- Pier 95 - all piles cased prior the 1980s. Stone filled reno mattress predating the 1980s.
- Pier 96 - all piles cased and two piles spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 97 - all piles cased and one pile spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 98 - all piles cased and one pile spliced prior the 1980s. Stone filled reno mattress predating 1980s.
- Pier 99 – all piles cased prior the 1980s. Stone filled reno mattress predating the 1980s.
- Piers 101- 109 - all piles cased prior the 1980s. Stone filled reno mattress predating the 1980s.
- Pier 110 - all piles cased and one spliced prior the 1980s. Stone filled reno mattress predating the 1980s.
- Pier 111 – all piles cased prior the 1980s. Stone filled reno mattress predating the 1980s.
- Pier 112- 113 – original.

5.2.12. It should be noted that a new pier numbering system will be used during construction.

5.3. Scheduled Monuments (SMs)

5.3.1. No SMs are located within the development area or the applied search area.

5.3.2. SM ME 179 - Hut Circle at Gellfawr – is located close to the northern end of the search applied area. It contains the remains of an isolated hut circle that probably dates to the Iron Age or Romano-British period.

5.3.3. SM ME 252; NPRN 270841- Fairbourne Anti-invasion Defences – is located to the SW of the applied search area boundary. The line extends for 2.5km along the coast. The defences are thought to have been constructed in the early 1940s.

5.4. The Landscape (Figure 5-8)

5.4.1. The proposed development area is located within the Landscape of Outstanding Historic Interest of Mawddach - HLW (Gw) 14. The area comprises the Mawddach estuary as well as the surrounding coastal sloped located to the west of Cadair Idris.

5.4.2. High concentrations of prehistoric activity are located on the higher ridges of the southern area of the estuary. These include monuments of high importance e.g. Ffordd-ddu trackway and field systems such as Llys Bradwen. No evidence of prehistoric activity appears to predate the Neolithic though it is probable that earlier activity is concentrated on coastal areas, therefore submerged by rising sea-levels in the postglacial period. Examples of this are found in peat-beds in Llanaber which have produced red deer antlers and cattle bones.

5.4.3. During medieval times, the area lay within three medieval parishes and two commotes Llanaber (in the commote of Ardudwy), Brithdir and Dolgellau and Llangelynnin (both in the commote of Tal-y-Bont). The aforementioned area contains the remains of medieval settlements and associated enclosures (e.g. Llynnau Gregennen). An examination of the existing landscape highlights that the present fieldscapes have not changed much in the last few centuries.

5.4.4. In post-medieval times, Barmouth and its surrounding countryside became a centre of attraction for artists, writers and thinkers. The area also begun to receive high numbers of tourists. These events led to the aesthetics of the area today. Prior to all these changes, Barmouth was a small finish settlement first recorded in the 16th century.

5.4.5. A further transformation of the area can be traced back to the arrival of the railway in 1867[5] when new communities were established in the town. The arrival of new infrastructure also attracted industrialists who built impressive mansions and planted many of the existing woods.

5.4.6. The remains of 19th century quarrying have also imprinted the area to date. Across the estuary, two slate quarries were opened in Panteinon Valley. There was also some lead, silver and copper mining at Cyfannedd fawr.

5.4.7. The applied search area also falls within Barmouth Panorama Walk – GD 26. The latter is defined by a very well-preserved Victorian footpath designed to allow views towards the estuary and its surroundings.

5.4.8. The Conservation Area of Abermaw - WAL/GWYN/34 (PRN 62509) - falls within the applied search area. Abermaw, or Y Bermo, has a history dating back to the early 19th century when the town began to expand as a result of the ship building industry (Anon 2020). However, the conservation area which comprises of the centre of the town includes medieval buildings such as Ty Gwyn (LB 4897) tower house, which dates to 1460 (Anon 2020). Thus, the historic centre of Barmouth has been settled for several hundreds of years.

5.4.9. The majority of the buildings contained within the conservation area date to the early 19th century when the town became a centre of the ship building industry. Records show that 138 vessels were built on the Mawddach estuary between 1770 and 1790 (Barmouth Town Council 2020). As such, the earliest developments centre around the harbour and 'the rock'. The wool industry also depended heavily on Barmouth harbour during the 18th century as it became one of the major export centres of wool in the country (Barmouth Town Council 2020).

5.4.10. The Conservation Area of Abermaw also includes a marble sculpture which was carved by Frank Cocksey in 1709 after a storm caused a vessel carrying marble from Genoa to beach in the Mawddach estuary (Anon 2020). The sculpture can be seen in the harbour. The Cambrian Railway and Viaduct which crosses the Mawddach Estuary, though not a part of the conservation area, comprises of a unique spectacle which characterises Barmouth to this day. Another unique element of the town is The Sailors' Institute, which is said to be one of the last remaining examples of its kind in Wales (Anon 2020).

6. The Results: Mapping Sources

[5] Opening of the Cambrian Railway which linked Aberystwyth with Pwllheli.

6.1. Map regression

Tithe map Parish of Llanaber in Merionethshire 1841 (Figure 8)

6.1.1. The tithe map of 1841 documents a well-urbanised area along High Street nowadays defining Abermaw Conservation Area.

6.1.2. The map also highlights the changing nature of the shifting sands forming the estuary of the river, particularly when compared to subsequent map editions.

6.1.3. The presence of quarrying is testified in field 650, listed as a quarry owned and occupied by Evan Richards.

6.1.4. The region of Fairbourne and Arthog appears largely inhabited at this point in time, and the railway bridge and the bridge are yet not documented as the opening only happened more than twenty years after.

OS County Series 1901 – 10:560 (Figure 9)

6.1.5. Substantial changes are perceived when comparing the 1841 map to the 1901 map edition.

6.1.6. Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) is documented in this map. It is known that the bridge underwent some changes between 1899 and 1902, being transformed from a drawbridge to a swing bridge. At this point, though it is not possible to discern in the map, the new northern end of the bridge must have been under construction.

6.1.7. The use of the swing bridge to let boats move up and down the estuary is attested by the dotted line that directs the vessels towards the swing bridge area, coinciding with the deepest region of the estuary and therefore navigable.

6.1.8. The main harbour and its associated buildings appear documented in this map. The beacon (PRN 29373, NPRN 308192) located to the SE of Ynys Brywd is recorded within this map edition.

OS County Series 1938 – 10:560 (Figure 10)

6.1.9. There are very few changes to the bridge during the period between 1901 and 1938.

6.1.10. Breakwater (PRN 19736) on Ynys Brywd is documented on this map. According to the HER entry, remains of this structure are still visible in the sand.

6.1.11. The harbour retains the same layout and structures as evidenced on the map from 1901. However, a slight realignment of the W shore allowed an extension to ‘Marine Parade’ which now provides access to the Quay and Baths at the S end of the harbour.

6.1.12. The NW shore of Fegla Fawr, adjacent to the NE elevation of the S end of the bridge, has changed shape to include a footpath which appear to originate at Fegla Fawr and terminate at the embankment abutting the bridge on the NE elevation. This appears to be an addition to already extant footpaths surrounding Fegla Fawr and the surrounding fields.

OS Plan 1980-81 1:2,500 (Figure 11)

6.1.13. Very few structural changes occur during the period between 1938 and 1980.

6.1.14. The only structural change noted on this map is the addition of a gateway in the centre of the bridge, denoted by the presence of a symbol exemplifying a gatepost. The purpose of a gateway in this location is somewhat uncertain, though it may possibly have provided access from the path to the train track.

6.1.15. The footpath noted on the previous map adjoining Fegla Fawr and the bridge is now represented as a disused tramway, suggesting that the footpath was converted into a tramway and fell into disuse during this period.

6.1.16. For the first time the bridge contains annotations referring to its use as a path. Similarly, the estuary is referred to as Mawddach Estuary for the first time.

6.1.17. The Breakwater (PRN 19736) located on Ynys Brywd is no longer depicted, instead is a patch of land referred to as sand and shingle.

6.1.18. The shape of the harbour is the same as it was denoted on the 1938 map. However, the harbour contains several new structures as well as 4 additional slipways. Also, the area located between Marine Parade and Jubilee Road, immediately N of the harbour, is now annotated as a car park.

6.2. LiDAR imagery (Figure 12)

6.2.1. 1m DSM and DTM data has been processed (hillshade) in order to examine the presence/absence of otherwise undetected sub-surface features.

6.2.2. No features of archaeological origin were observed during its examination. However, both DSM and DTM images enhanced the character of the surrounding area and the effect of the force of the river over the landscape.

6.2.3. The slopes of Cader Idris where the northernmost pier of the bridge anchors are clearly shown sloping down and meeting the riverbank. The river and some of its adjacent land (particularly to the E and SE) has the imprint of former river outlets and of landforms characteristic of floodplains, where to the W and NW the town of Barmouth is located.

6.2.4. The nature of the shifting sands is also clearly observable within the river estuary, leading to the seashore.

6.3. Aerial Photographs

1946 - 4631 RAF106GUK146

6.3.1. This image is a black and white aerial photo of Barmouth Viaduct and part of Abermaw Conservation Area. The disused tramway located on the NW shore of Fegla Fawr adjacent to the NE elevation of the bridge is clearly visible on this image. The vantage point of the image clearly shows the deepest part of Mawdachh Estuary underneath the swing bridge section of the viaduct. Breakwater (PRN 19736) located upon Ynys Brywd SW of Barmouth harbour is clearly visible. Likewise, the Harbour appears relatively underdeveloped in this image, owing to the fact that the extension of Marine Parade is not yet visible depiste it being noted on the OS County Series 1938 map (Figure 10). This image provides aerial views of Listed Buildings Glanafon (LB 15483)

and The Clock House (LB 15484; NPRN 6575) which are located N of the bridge across the estuary.

1950 - RAF540

6.3.2. A 1950 aerial photographs showing two views of Barmouth Viaduct over the Mawddach Estuary to Morfa Mawddach. The photographs show the deep channels of the estuary with the town of Barmouth located to the NNW of the viaduct. To the N of the viaduct is the Grade II listed building the Clock Tower (LB 15484; NPRN6575) and Grade II listed terrace, Glanafon (LB 15483) to the NNE of the Viaduct. Views towards Barmouth to the High Street, part of the Abermaw conservation area are visible NW from the viaduct.

1952 - 540RAF754

6.3.3. This black and white aerial photograph displays Abermaw Conservation Area and the viaduct in a larger scale, providing views of the wider landscape. Nonetheless the viaduct is clearly visible in the image on a NW-SE alignment. Mawddach estuary is clearly at its deepest under the section of the viaduct comprising of the swing bridge, while the remainder of the estuary comprises of sand and water channels. The disused tramway adjoining the NE elevation of the bridge adjacent to Fegla Fawr is clearly defined. Likewise, land S of the viaduct is also clearly defined as agricultural field parcels. The line of the Cambrian Railway line is clearly visible in the S of the image before it passes over Barmouth viaduct and towards Barmouth town centre. However, the access track is not yet visible, suggesting it was constructed at a later date. The land N of the viaduct and E of Barmouth town centre is defined by hills and grassland.

1960 - 6002 543_922_2F21 0279

6.3.4. This black and white image of Barmouth viaduct provides views of Mawddach Estuary and the shoreline to the W of the image. Like in the previous images the deepest part of Mawddach estuary is clearly visible underneath the section of the viaduct comprising of the swing bridge. Breakwater (PRN 19736) on Ynys Brywd is partially visible in the N of the image, W of the viaduct. Listed Building Glanafon (LB 15483) is visible just NE of the viaduct. Part of the disused tramway is visible adjacent to the NE elevation of the viaduct. Field parcels immediately SW of Mawddach estuary are clearly defines and comprise of irregular shapes and sizes.

1962 - RAF58_5165 F22

6.3.5. This black and white image shows Barmouth viaduct and land to the S of the viaduct. The land to the S comprises of agricultural field parcels and the Cambrian Railway. The disused tramway to the NW of Fegla Fawr adjoining the NE elevation of the viaduct is clearly defined. Barmouth harbour is also partially visible in the N of the image, comprising of Abermaw Conservation Area. Likewise, Listed Buildings Glanafon (LB 15483) and The Clock House (LB 15484; NPRN 6575) which are located N of the bridge across the estuary are visible. The S area of the estuary is defined by sand whereas the N area of the estuary comprises of deep water, passing under the viaduct at the section containing the swing bridge.

1964 - 6426 raf543_2889

6.3.6. This black and white image shows Abermaw Conservation Area and Barmouth viaduct. Breakwater (PRN 19736) on Ynys Brywd is clearly defined off the coast.

Barmouth beach is also visible as well as Barmouth Harbour which includes the reconstruction and extension of Marine Parade. The disused tramway is visible adjacent to the NE elevation of the viaduct. The landscape appears unchanged from that observed in previous images. The harbour appears more populated with structed compared to the image from 1946, which is congruous with changes observed in the map regression.

1971 - 7158 OS 71_031 072 and 71117 OS 71_032 040

6.3.7. This black and white image depicts Barmouth Viaduct spanning over the Mawddach estuary. Breakwater (PRN 19736) on Ynys Brywd is clearly defined off the coast. Listed Buildings Glanafon (LB 15483) and The Clock House (LB 15484; NPRN 6575) which are located N of the bridge across the estuary are visible. Abermaw Conservation Area is not visible in this image, however, hill to the N area visible as well as structures located along the northern shore of the estuary.

6.3.8. The second image is also in black and white and depicts the S part of the viaduct, including Fegla Fawr adjacent to the NE elevation of the viaduct. Field parcels are visible to the S of the estuary and comprise of irregularly shaped field boundaries. The estuary itself comprises of sand and water channels as the estuary is shallowest in this region. The Cambrian Railway can be seen on this image heading SW.

1986 - Oct_Nov 9606 JAS67_86 0192

6.3.9. The colour image of the viaduct clearly shows the viaduct crossing over the Mawddach estuary, as well as Abermaw Conservation Area and field parcels to the S of the viaduct. The remains of Breakwater (PRN 19736) on Ynys Brywd is clearly defined off the coast of Barmouth. Barmouth contains a car park adjacent to the harbour which was not visible on previous images. Some sort of embankment or wall is visible adjacent to the access track to the S of the viaduct and next to Fegla Fawr. The estuary contains many water channels amongst the sand to the S whereas the N comprises of deep water containing small vessels. Fields to the F of the viaduct are the same shape as noted on previous images and do not appear to change over time.

1989 8955 OS89_400 082

6.3.10. This black and white image depicts Abermaw Conservation Area to the N, Barmouth viaduct and Mawddach estuary. The remains of Breakwater (PRN 19736) on Ynys Brywd is clearly defined. There are many more boats moored off the coast of Barmouth Harbour than in previous images. Likewise, the sandy S part of Mawddach estuary contains clearly defined water channels, particularly to the W. The disused tramway between the NE elevation of the viaduct and Fegla Fawr is also visible on this image. The carpark within Barmouth adjacent to the harbour is densely populated, suggesting the town was growing as a popular tourist destination. A sandy embankment is now visible off the NE elevation of the S half of the viaduct.

1990 9001 ADAS 450 112

6.3.11. This is a black and white image depicting Barmouth Viaduct, part of Abermaw Conservation Area, the remains of Breakwater (PRN 19736), the disused tramway and Fegla Fawr. There are no discernible differences on this image except for the increased population of boats moored in the harbour.

1992 9258 RAF1PRU2470 290

6.3.12. This image comprises of a larger scale depicting of the Viaduct; however, it does encompass the surrounding landscape. There are no differences noted on this image compared with previous images. The only notable change may be the presence of sandy embankments within Mawddach estuary to the E.

2009 Nextperspectives

6.3.13. This colour photograph depicts the Viaduct crossing over Mawddach estuary and the S part of Abermaw Conservation Area. The only noticeable change is the build up of sand within the estuary which is in stark contrast to previous images. Boats are now confined to channels in the N part of the estuary.

2016 Bluesky Getmapping

6.3.14. This colour photograph depicts Barmoouth Viaduct, part of Abermaw Conservation Area, the remains of Breakwater (PRN 19736) and the disused tramway. One noticble difference is the encroachment of grassland onto areas of land which formerly comprised of the estuary. The Access track to the S of the viaduct is clearly defined in fields adjacent to Fegla Fawr. The sandy Beach W of Barmouth appears to have grown in size compared to previous images. Listed Buildings Glanafon (LB 15483) and The Clock House (LB 15484; NPRN 6575) which are located N of the bridge across the estuary are also visible on this image. Several new structures are visible on the hillside immediately NE of the viaduct and probably comprise of the new build dwellings observed during the site visit.

6.4. Intertidal deposits

6.4.1. Intertidal deposits are the remnants of past landscapes now submerged by high tide due to past sea level change. Instances of these deposits are particularly prominent along the Welsh coastline and represent a vast landscape lost to post Holocene sea level rise. Deposits identified at different location are not necessarily representative of the same environments or time periods as at a neighbouring location. Therefore relying on data from a nearby location to aid interpretation of the site under investigation is not a reliable approach and every effort should be made to investigate intertidal sites when the opportunity arises to obtain valuable archaeological and palaeoenvironmental evidence (Philp 2018a). This is also in line with the current Welsh Archaeological Research Framework, which cites a lack of palaeoenvironmental evidence in Wales as a whole with specific emphasis placed on gaining better understanding of the evolution of Wales' estuaries and coastlines through mapping, sampling, dating and analysing intertidal deposits.

6.4.2. The site near Barmouth is situated towards the mouth of the estuary and is within the tidally influenced fluvial zone. Intertidal deposits within estuarine settings are common, often protected by deposits of fine estuarine silts and low levels of erosion. The Severn Estuary in South Wales has produced multiple significant archaeological sites within its intertidal zone (Bell 2007). The sand bars at the mouth of the River Mawddach estuary, on which the site sits may also provide further protection against erosion, by acting as a buffer against heavy wave action.

6.4.3. The local coastline already holds precedent for producing archaeologically significant intertidal deposits. Just to the north west of Barmouth, on the beach at Llanaber, an

area of peat exposure is intermittently exposed. Evidence of medieval timber trackways and potential Roman archaeology have been identified on the surface and red deer bones have been recovered from within the peat. The local landscape characterisation argues there is a high potential for much earlier evidence within the peat deposits themselves (GAT 2020).

6.4.4. To the south of Barmouth at Friog corner, investigations by Archaeology Wales in 2018 (Philp 2018b) identified further intertidal deposits. At the time of investigation these were buried beneath a substantial amount of sand on the beach, but the deposits have been known to be exposed intermittently in the past. The deposits identified were evidence of a Neolithic freshwater fenland landscape dating to c.3000cal BC. Also on the west coast of Wales similar deposits have also been identified at Ynyslas and Borth to the south of Cardigan Bay, which has deposits within the sequence dating back as far as the Mesolithic and directly related archaeological evidence dating to the Bronze Age (GAT 2020).

6.4.5. Further intertidal deposits have also been identified on the southern and northern coasts of Wales (Nayling 1998, Bell et al. 2000, Bell 2007, Brayshay et al. 2007, Bennet et al. 2010, Murphy et al. 2014, Philp 2018a.) These deposits rage from Mesolithic to Bronze Age in date and have contained archaeological evidence including human and animal footprints, lithics, animal bone and human remains.

6.4.6. The presence of the site within an archaeologically rich area (GAT2020) increases the likelihood of archaeological evidence within the intertidal deposits. However, value should not only be seen within evidence of material culture, but also within the deposits themselves, which provide a record of the changing environment throughout human history within the area. In itself this is a valuable source of evidence and may offer clues in terms of human-landscape interaction and provide an environmental context within which to place local archaeological evidence, even if not directly associated with the site.

7. Site Visit (Plates 1-68)

7.1.1. A site visit was undertaken on the Wednesday 8th of July, to carry out a photographic survey of Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) and the access track located SE of the viaduct.

7.2. Access Track (Plates 1-10)

7.2.1. The access track is an existing feature located on land directly SE from Barmouth Viaduct. This area is characterised by an open waterlogged field with the Cambrian Coastal railway line located to the SW and and to the SE. The access track is an existing feature located on land directly SE from Barmouth Viaduct. This area is characterised by an area of sandy waterlogged grassland with the Cambrian Coastal railway line located to the SW and Fegla Fawr to the SE. The existing track is oriented on a N-S alignment, that is approximately 642m in length until it reaches the Mawddach estuary, then turns on a right angle to run on an E-W alignment approximately 395m in length up to the viaduct. The track is made up of a mixture of stone and shale and is between 2-3m wide on the section that runs N-S, up to the banks of the estuary. The section of track that runs on an E-W alignment towards the viaduct is essentially the bank of the estuary and is approximately between 3-5m wide and slopes off into the water on the N side. A partially collapsed drystone wall was observed at the end of the N-S section of the track, running on an E-W alignment. The drystone wall is partly intact on a section of embankment located E of the track, where it appears water has eroded part of the embankment, causing the wall to collapse in this area.

7.2.2. The open sandy waterlogged grassland is used for sheep grazing. The open grassland is undulating in appearance and has numerous pockets of surface water across the area. No archaeological features were observed on the surface in the area of the trackway.

7.3. Barmouth Viaduct, upper section (Plates 11- 42)

7.3.1. The Barmouth Viaduct consists of 114 timber trestle sections with a timber planked walkway and a single-track railway line a top, with the northernmost section of the viaduct comprising of a cast iron and steel swing bridge. During the site visit to the viaduct observations were made to ascertain if any of the original 1867 structure survives and to document the refurbishments made to the viaduct during its history, this will be discussed below.

7.3.2. The survey commenced from the SE end of the viaduct at trestle one. The transverse deck planks that make up the pedestrian walkway of the viaduct vary in states of preservation, due to them being replaced over time. A large number of the deck planks appeared to have been replaced in recent times due to the colour of the planks being much lighter in appearance, compared to older ones with clear signs of weathering and ware, and a lot of them were clearly bowing towards the centre (See plates 17 and 18). The outer handrail of the pedestrian walkway also contained replacement components exemplified by lighter shaded timbers, again these were clear to see and were most likely replaced at the same time as the transverse deck planks of the walkway (See plates 16 and 18).

7.3.3. Other notable areas of disrepair to the top of the viaduct are the longitudinal outer beams that support the transverse deck planks that the railway track lies upon. The

longitudinal outer beams rest on the horizontal support beams of the trestle beneath and fixed together via a metal strap fixing. Some of the longitudinal outer beams, especially those observed between trestles 5 and 6 were in a bad state of disrepair as the wood is rotting away and the metal strap was heavily corroded (See plate 12 and 26). However, refurbishments have been undertaken on other longitudinal outer beams where the wooden beam has been replaced and two metal plates have been bolted to the neighbouring beams either side to offer extra stability (See plate 14). The refurbishments detailed above were carried out within the last five years according to the engineer that was in attendance during the site visit.

7.3.4. There was clear evidence of repairs undertaken on the transverse deck planks on the railway track at various points along the line. These repairs were observed on trestle 50 where there is a group of planks that differed slightly in appearance and fittings used to secure them to the trestle beneath (See plate 20). The planks are all fairly dark in appearance due to weathering and grime, from being in such close proximity to the track as the diesel trains passing over will emit dust and dirt discolouring the timber over time. There is one plank in particular that is heavily decayed and in clear need of replacement, compared to the others either side of it. The metal fittings used on this group of planks to secure them differ in appearance indicating three phases of refurbishment, with the most recent having a much larger bolt with the addition of a washer (See plate 20).

7.3.5. Other notable areas that were observed on the railway track were the transverse deck planks at trestle 81 and 82, where a number of planks that the track lies upon are sagging. It appears measures have been taken to prop up the track with metal plates and timber boards to keep the track level. The sagging of these deck planks are most probably due to the horizontal beam atop of the trestle beneath being weakened over time (See plates 24 and 25).

7.3.6. The swing bridge located at the northwesternmost end of the viaduct was observed and has had numerous repairs carried out on the structure. The spans of the viaduct are constructed using the hogback lattice truss deign, fixed with rivets and bolts. It was evidently clear when surveying the swing bridge that modern repairs to the structure had taken place over time, as the majority of the structure has clear signs of corrosion. This was most evident on the hogback lattice trusses on the spans of the swing bridge, where the lattice supports have been removed due to their state of disrepair (See plates 33 - 36). The lattice work on the on the NE facing elevation of the southernmost span appeared to be the worst affected by corrosion, where the diagonal lattice work has been removed and replaced with horizontal rectangular plates, fixed with a mixture of rivets and bolts (See plate 35).

7.3.7. In addition to the above, the outer diagonal girders that the rectangular plates are attached have been replaced and fixed to the top of the span via a riveted rectangular plate (See plate 34). The SW facing elevation of the southernmost span retained some of the diagonal lattice work on the trusses, and where there was corroded lattice work, these too have been removed and replaced with riveted rectangular plates. However, on some of the trusses there was an absence of either lattice work or plates and appeared to have no central structure to the truss whatsoever (See plate 36).

7.3.8. Located between the two hogback lattice spans on the NE facing elevation of the swing bridge is a cast iron hand crank with cogs. The cast iron hand crank would have served

as part of the mechanism to pivot the bridge into position (See plates 37 - 38). The hand crank appeared to be in a good state of preservation and is an original feature of the swing bridge.

7.3.9. A metal handrail with modern stainless-steel clamps was observed on the NE facing elevation of the swing bridge. The handrail runs the entirety of the spans of the swing bridge and is attached to the lattice work on the trusses. Modern stainless-steel clips have been added in recent times as the original fittings have corroded. The stainless-steel clips are clamped to the metal work and do not appear to penetrate it, probably due to the frailty of the metal work they are attached to. Some older fittings were present and functioning and appeared corroded (See plates 31 - 32).

7.4. Barmouth Viaduct, Under side (Plates 43 - 64)

7.4.1. The underside of Barmouth Viaduct was surveyed during low tide, some of the trestles could not be accessed due to deep pockets of water retaining in depressions where the sand had washed away. The site visit to the underside of the viaduct was commenced from the SE end of the structure.

7.4.2. The first notable alterations to the underside of the viaduct were on trestle 2, where the metal straps that brace the cross-head beams to the central beam on the underside section of the railway track have been replaced. The replacement straps are made from galvanised steel with a square frame attached via nuts and bolts to hold the beams firmly together (See plates 43 – 44 and 48). The galvanised steel straps are quite noticeable compared to other metallic fittings observed on trestle 2, as all other fittings appeared older in date and had signs of corrosion. According to the engineer who was in attendance during the visit, noted that the galvanised steel straps were probably added during the 1990s, however engineering plans detailing the straps are not available. All other metallic fittings on trestle 2 correspond to engineering plans from the 1980s.

7.4.3. The dividing trestle of 2 and 3 has a horizontal waling at its foot, that extends out approximately 2m either side of the 4 piles that make up the trestle. The horizontal waling encloses the bottom of the 4 piles with a diagonal beam attached to the horizontal waling at the bottom, and a reinforced concrete pillar flanking either side of the trestle. The horizontal waling's are only found on every fifth trestle of the viaduct and correspond to the alterations undertaken in the 1980s (See plate 45 and figure 16.1).

7.4.4. Reinforced concrete casings were observed on a majority of piles on the viaduct and were added as part of the alterations of the 1980s. The casings were added to protect the timber piles at the foot of the trestles from *Teredo Navalis.* However, water erosion has caused significant damage to the concrete casings and stripped them down to the rebar beneath (See plate 46). The worst affected by the water erosion are the piles on the seaward side of the viaduct. Observed on trestle 14 and 32 are what appears to be white plastic PVC coverings clipped together on two sides by metal fixings (See plates 47 and 50). Again, engineering plans could not be obtained to determine the date of when these were added, however the engineer who was present noted that they were probably from the 1990s.

7.4.5. Located at trestles 55, 86, 87 and 88 were stumps protruding from the water, that appear to be the remains of older piles. The stumps were heavily calcified, and it could

not be ascertained if they were of timber or concrete, as access to them was impeded by fairly deep water in these areas (See plates 53, 54, 56 and 57). The stumps at trestle 55 were in the best state of preservation and were approximately 1m in front of the dividing trestle of 55 and 56 and aligned perfectly with the functioning piles behind. The stumps of the suspected older piles under trestle 55, 86, 87 and 88 are at a section of the viaduct where there is no reno mattress on the estuary bed and appears the reno mattress ceases at trestle 54 (See plate 55). The reno mattress at trestle 54 is approximately 0.50m thick and has a heavy covering of seaweed. It is unclear if the reno mattress in the sections of the viaduct where the pile stumps are located has been removed, or if there was ever any laid on the estuary bed at these sections of the viaduct. Notwithstanding, the 1980s renovation plans included the placement of reno mattresses in pier 55, and indicated the existence of older mattresses in 86, 87 and 88. The absence of these structural elements may suggest alterations postdating the 1980s.

7.4.6. The swing bridge section of the underside of the viaduct was inaccessible due to deep waters. The cylindrical cast iron piers of the underside of the swing bridge appeared fairly corroded along with the lattice trusses connecting them. There was no evidence of alterations made to any of the cylindrical piers, however a closer inspection was needed to confirm this (See plates 61 - 64).

7.4.7. Atop the cluster of the four cylindrical piers at the centre of the bridge is the central pivot, to rotate the single span section when it was operational. The central pivot appeared to be in relatively good condition, compared to the lower sections of the piers (See plates 61 - 64).

7.4.8. The survey of the viaduct during the site visit to Barmouth highlighted that the viaduct has been heavily renovated over time. The vast majority of the upper and lower sections are constructed from wood with most, if not all, having been replaced over the viaduct's history. Evidence suggests from observing the dilapidated appearance of the replacement timbers and their fittings from just 40 years ago its highly unlikely there is a significant percentage of structural remains surviving from 1867. This in part is due to the harsh elements the structure has been subjected to, along with the pedestrian walkway being the only means of transport across the estuary on foot would have had a detrimental effect on the timbers of the walkway. This also apparent when observing the railway track and the transverse deck planks along with the trestles beneath, due to the stresses the structure has been subjected to, with trains travelling on the line over such a prolonged period of time.

7.4.9. The swing bridge and its cylindrical piers beneath are the most intact portion of the structure, though corroded in parts, the alterations appear slight in comparison to the timber sections of the structure. The cylindrical piers and the central pivot have slight signs of erosion and appear relatively sound, though as mentioned previously a closer inspection was needed to clarify this.

8. Impact Assessment

8.1. Assessment of Archaeological Potential and Importance

8.1.1. As laid out in section 5, the Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) is

central to this report as the proposed development is focused upon the refurbishment of the timber sections of the viaduct. The viaduct represents a site of **High** (National) archaeological importance.

8.1.2. The refurbishment of the viaduct includes the removal and replacement of a number of timbers and beams. A few these timbers and beams are likely to be contemporary with the construction of the viaduct or dating to main episodes of repair, and therefore of archaeological/historic importance. Therefore, there will be a **Moderate/Major** potential for archaeological remains associated with the Post-Medieval period.

8.1.3. The area surrounding the proposed development is known to contain areas of submerged peat. This peat may contain important prehistoric archaeological remains, such as; flint flakes, picks and antler tools. There are examples of such within the wider landscape. If the proposed development includes the disturbance of peat deposits than this will have a **Low/Moderate** potential for archaeological remains associated with the prehistoric period.

8.2. Previous Impacts

8.2.1. Previous impacts across the proposed development area are of great significance in determining the survival and importance of the known and potential archaeological resource.

8.2.2. In the 1980s the viaduct was closed and underwent a series of extensive repairs due to damage caused by *Teredo Navalis* (this is discussed in detail in section 5.2.11). It appears that the repairs were focussed upon the piles, and they were either replaced or covered with cement and reinforced with glass-reinforced concrete jackets. This would have impacted the archaeological/historical resource of the viaduct. Nonetheless, the remaining structure and components of the viaduct retain a good archaeological potential that will likely provide an insight to Post-Medieval construction techniques.

8.3. Potential Impacts of the Proposed Development

8.3.1. The proposed development is still in the development process, but the current designs include; replacement of 2,394 structural timber members, including 124 main beams, 58 edge beams and 22 pedestrian walkway beams, replacement of 50 piles & 64 crosshead timbers, corbels, with a new Glass Reinforced Plastic (GRP) to the Up-cess trackside maintenance walkway & new parapet hand railing, replacement of associated stainless-steel straps and bolts plus other identified strap replacements, replacement of concrete surrounds to piles riverside, full longitudinal timber and rail replacement across the structure, new track guard panels at either end of the structure.

8.3.2. The proposed development also includes upgrading an existing track to the SE of the development along with the installation of a temporary site compound.

8.3.3. The proposed development also has the potential to generate indirect effects on archaeological sites, such as altering the visual setting or tranquillity of the sites and landscapes.

8.4. Historic Landscapes

8.4.1. The proposed development area is located within the Registered Historic Landscape

of Mawddach (HLW (Gw) 14). The value of the asset is considered **High** as it contributes to the overall landscape designation. While the bridge itself will undergo an in-depth process of renovation, it will not trigger changes to the registered landscape itseld. It is therefore noted that the significance of the impact will be **Neutral**.

8.4.2. No Registered Historic Park & Gardens will be directly or indirectly affected by any development. Therefore, there will be **No Change**.

8.4.3. Although the Conservation Area of Abermaw (WAL/GWYN/34) lies in close proximity to the proposed development area, a site visit has determined that the indirect (visual) impacts will be limited. Views from the high street towards the viaduct are obstructed by a promenade or bridge (Plate 66). Therefore, beyond the construction phase, the impact upon Abermaw Conservation Area will be **Negligible**.

8.5. Scheduled Monuments

8.5.1. No Scheduled Monuments (SMs) will be directly affected by the proposed development.

8.5.2. This assessment has identified that the Hut Circle at Gellfawr (ME 179) and the Fairbourne Anti-invasion Defences (ME 252) are close to the search area considered in this report. Both of these sites have the potential to be indirectly affected by the development, and this affect is likely to take the form of an indirect visual affect. However, during the site visit it was established that neither of the SMs can be seen from the proposed development area due to intervening topography. Therefore, there will be **Negligible** to these SMs.

8.6. Listed Buildings

8.6.1. The Barmouth Viaduct (LB 5207) will be directly impacted. The proposed development and renovations are centred upon this Listed Building. The latter is considered of **High Value.** However, on this particular occasion it is noteworthy that the events of restoration and repair are can outweigh the significance of the elements that would otherwise be lost through decay. Therefore, while the magnitude and significance of the impact is considered **Major,** the impact might be rendered **Beneficial**.

8.6.2. In total, this assessment has identified fifty LBs within the search area, but other than Barmouth Viaduct (LB 5207), a site visit has established that only a further two would be impacted. The impact would be an indirect (visual) impact to Glanafon (LB 15483) and The Clock House (LB 15484). Therefore, the impact upon these LBs is likely to be **Minor**.

8.7. Non-Designated Archaeological Sites

8.7.1. The area surrounding the proposed development is known to contain areas of submerged peat. This peat may contain important prehistoric archaeological remains, such as; flint flakes, picks and antler tools. There are examples of such within the wider landscape. If the proposed development includes the disturbance of peat deposits than this will have a **Low/Moderate** potential for archaeological remains associated with the prehistoric period.

8.7.2. Likewise, during the site visit it was noted that the riverbed contain the remains of possible former piles. The latter must be taken into consideration as they represent the

material remains possibly belonging to the older structure. The proposed development is considered to have a **Low/Moderate i**mpact on these archaeological remains.

9. Conclusions

9.1. Impacts on Designated Assets

9.1.1. The Registered Historic Landscape of Mawddach (HLW (Gw) 14) will be directly and indirectly impacted by the proposed development. The entire development area is located within this landscape. The direct impact will consist of the construction phase of the viaduct's restoration. The proposed development will also have an indirect visual impact upon the registered landscape throughout the construction phase and afterwards, the combination of the direct and indirect impact upon Mawddach (HLW (Gw) 14) is considered to be **Moderate**.

9.1.2. There are two Scheduled Monuments that have the potential to be indirectly impacted by the proposed development. However, a site visit has determined that both Hut Circle at Gellfawr (ME 179) and Fairbourne Anti-invasion Defences (ME 252) will not be visually impacted by the proposed development. Therefore, there will be **No Change** to these monuments.

9.1.3. The Barmouth Viaduct (LB 5207) will be directly impacted. The proposed development and renovations that this assessment has considered is centred upon this structure. The planned renovations are likely to change the majority of the archaeological components of this structure, i.e. the timbers, and therefore the impact is likely to be **Major.**

9.1.4. There are also two Listed Buildings that have the potential to be indirectly impacted by the proposed development. However, a site visit has determined that both Glanafon (LB 15483) and The Clock House (LB 15484) and the impact upon these LBs is likely to be **Minor**.

9.1.5. It must be noted that the impacts of proposed development that are discussed above could also consist of positive impacts. Although the development is likely to have indirect (visual) impacts on certain heritage assets the restoration has the potential to improve the appearance of the viaduct.

9.2. Impacts on Non-Designated Assets

9.2.1. No non-designated archaeological sites will be directly or indirectly impacted by the proposed development. Therefore, there will be **No Change**.

10.Mitigation

10.1.1. This assessment has consistently shown that the Barmouth Viaduct (LB 5207; NPRN 34918; PRN 63096) is central to this report, and it is apparent that further archaeological mitigation is needed on this structure. Such measures will be considered in relation to the listed building application.

11.Sources

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Maps

- Tithe map Parish of Llanaber in Merionethshire 1841
- OS County Series: Merionethshire 1901 10:560
- OS County Series: Merionethshire 1938 10:560
- OS Plan 1980-81 1:2,500

Archaeology Wales

Figures

Figure 1. Site Location.

Figure 2. 1km applied search area.

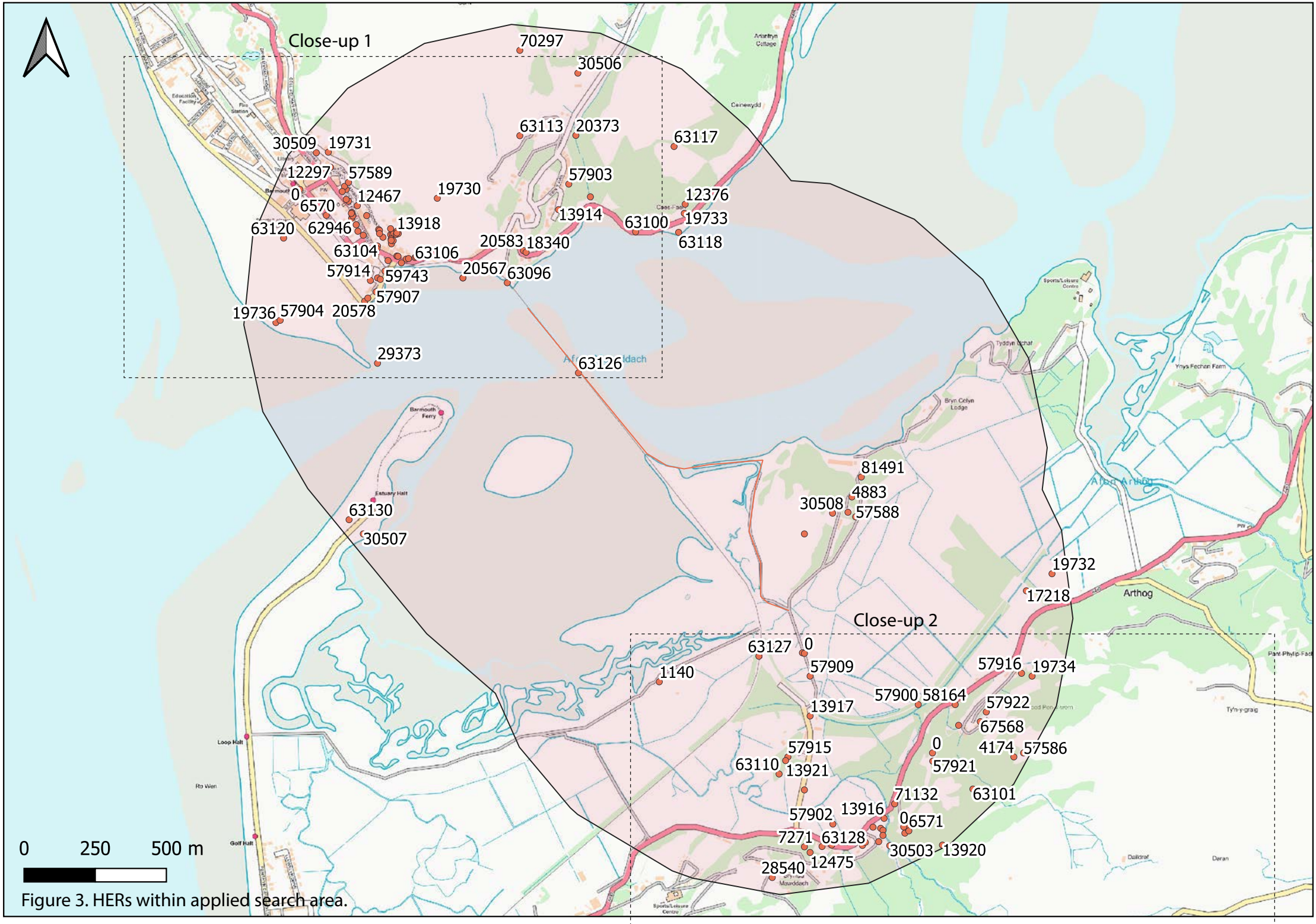


Figure 3. HERs within applied search area.

Figure 3.1. Northermost region of applied search area.

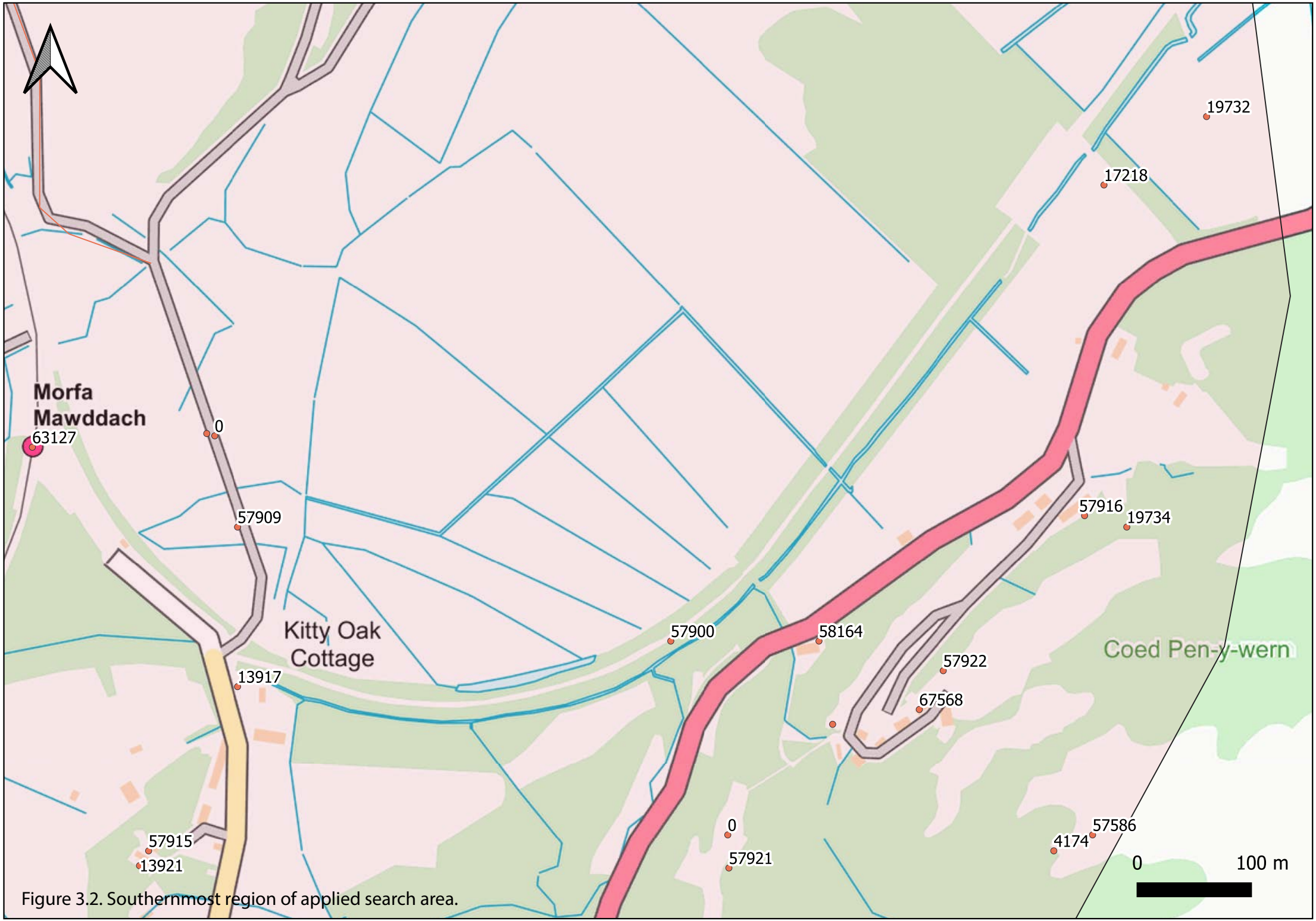


Figure 3.2. Southernmost region of applied search area.

Figure 4. 1 Listed Buildings within nothern end of applied search area.

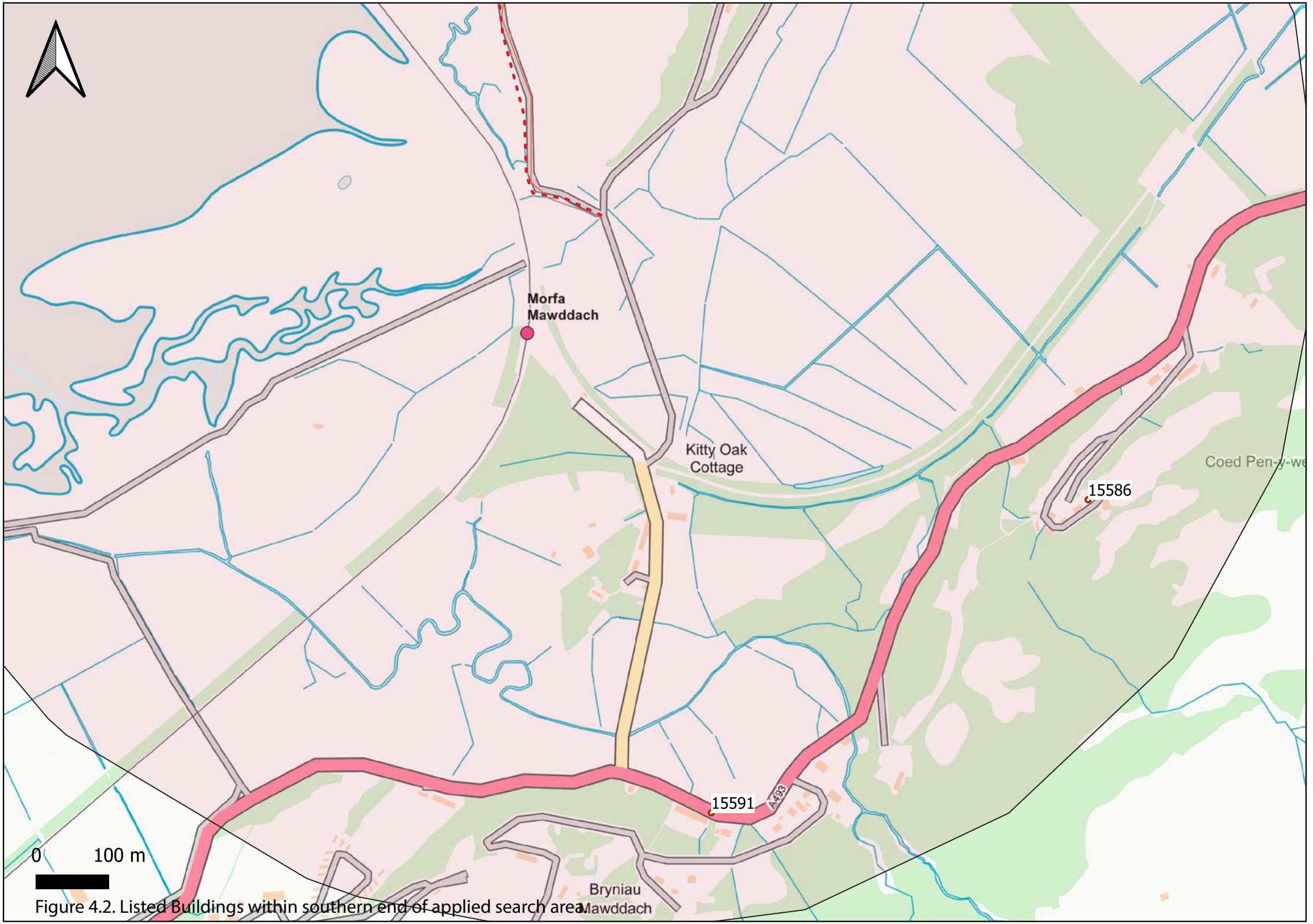
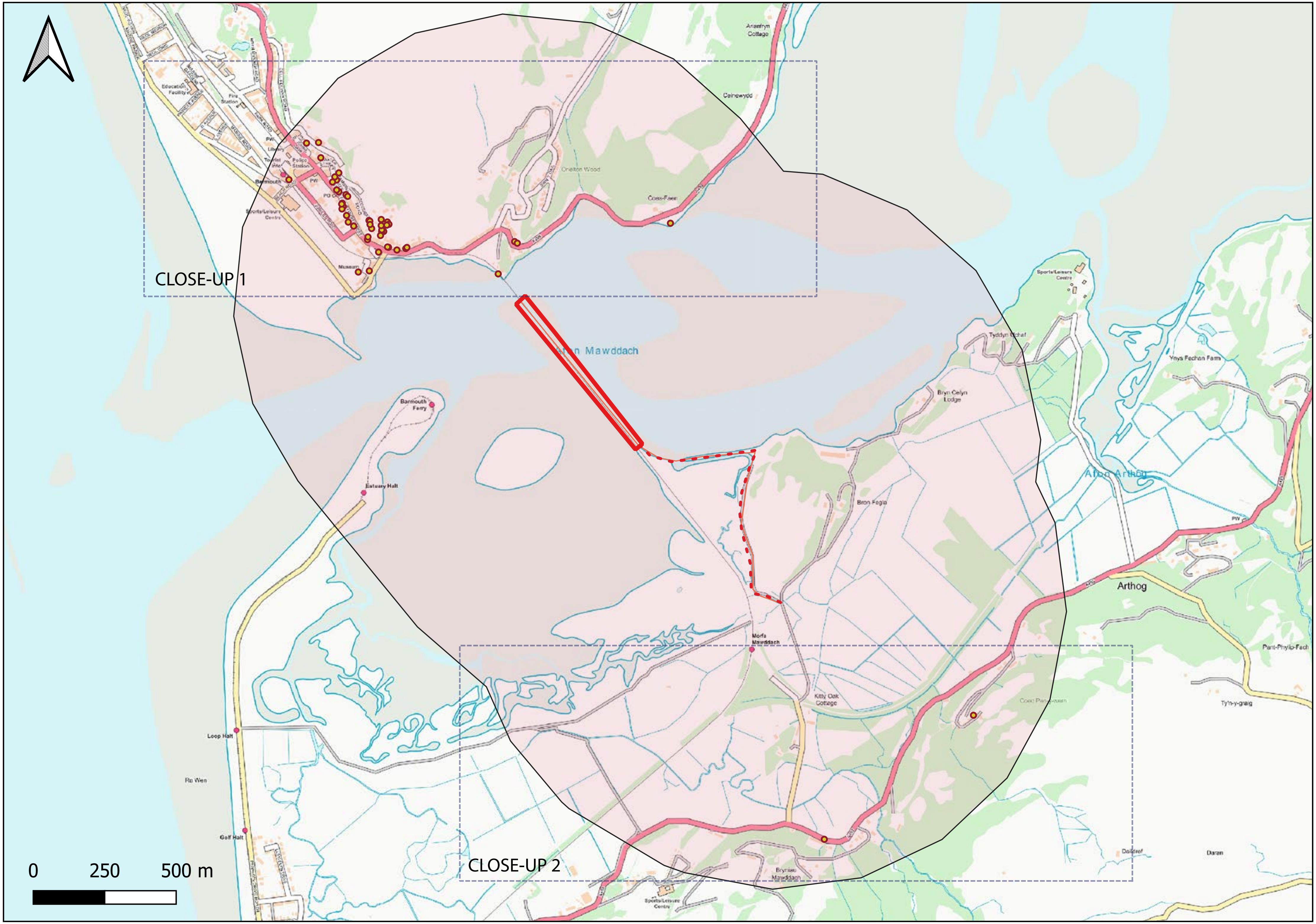


Figure 4.2. Listed Buildings within southern end of applied search area



CLOSE-UP 1
CLOSE-UP 2
Afon Mawddach
Barmouth
Barmouth Ferry
Estuary Halt
Morfa Mawddach
Arthog
Afon Arthog
Bryn Celyn Lodge
Bron Fegla
Tyddyn Uchaf
Ynys Fechan Farm
Kitty Oak Cottage
Loop Halt
Golf Halt
Ro Wen
Coes-Faen
Cerrig-ddwy-felen
Arianfryn Cottage
Sports/Leisure Centre
Museum
Library
Police Station
Fire Station
Education Facility
Pant-Phylip-Fach
Ty'n-y-graig
Daran
Brynau Mawddach
0
250
500 m

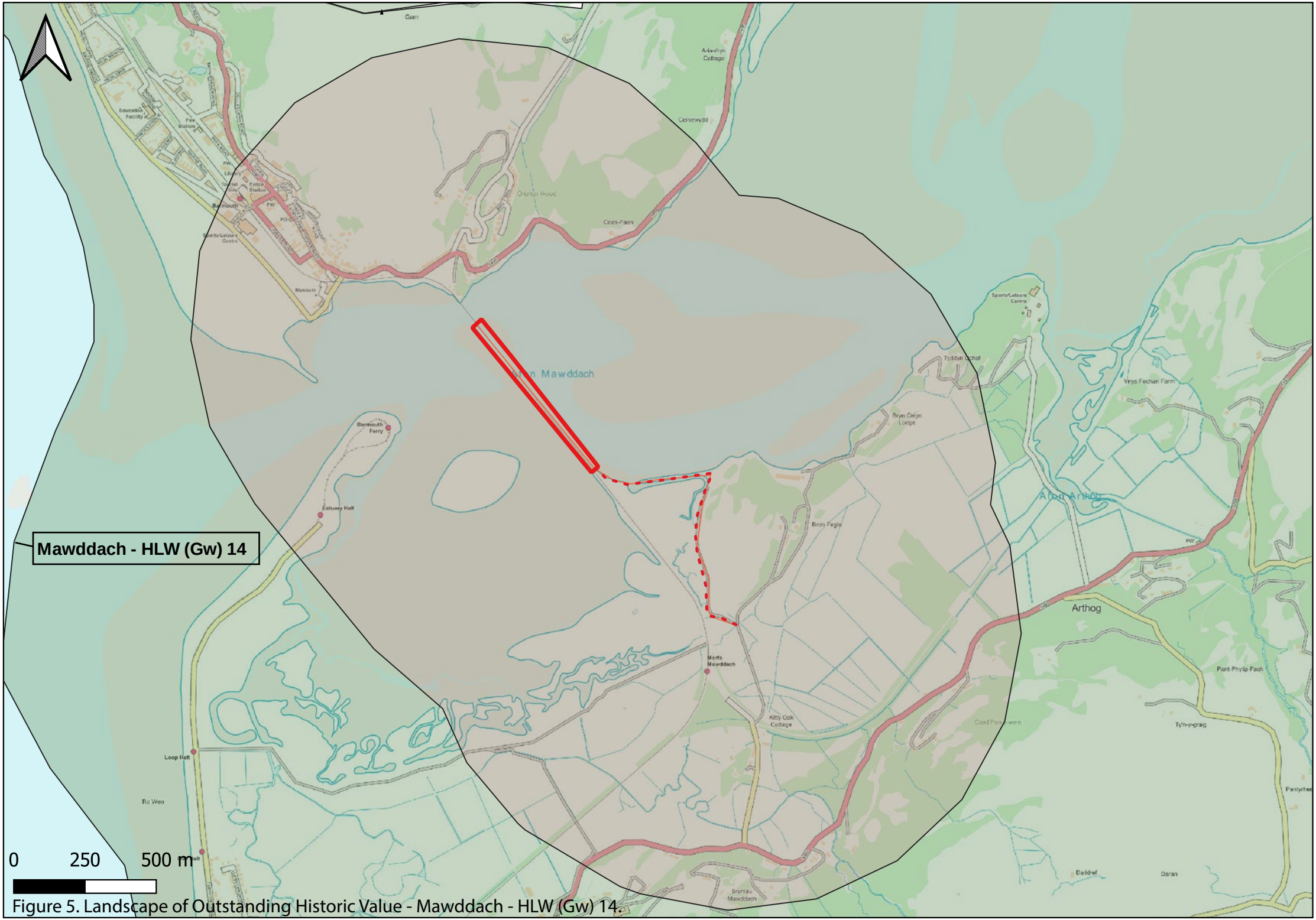


Figure 5. Landscape of Outstanding Historic Value - Mawddach - HLW (Gw) 14.

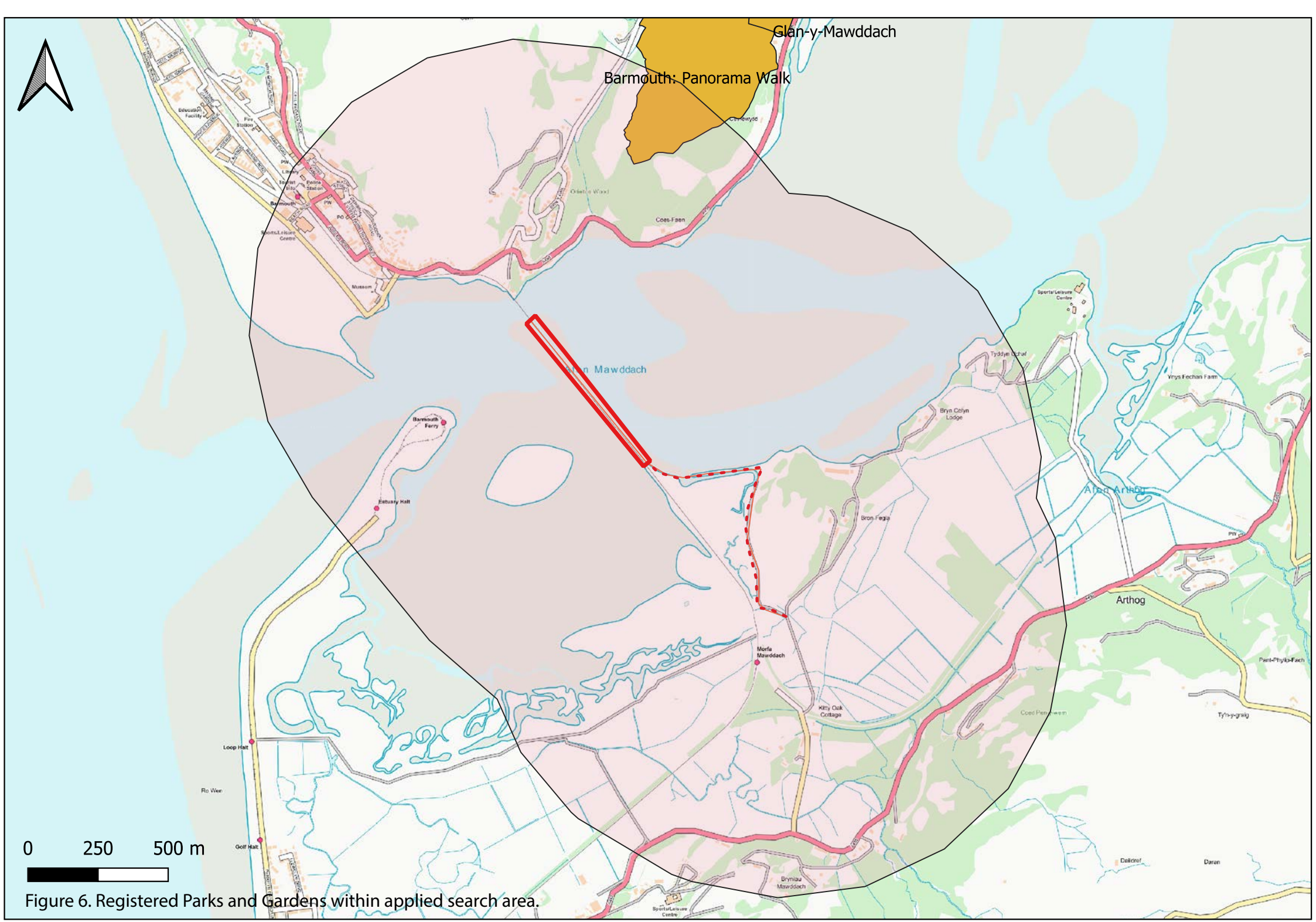


Figure 6. Registered Parks and Gardens within applied search area.

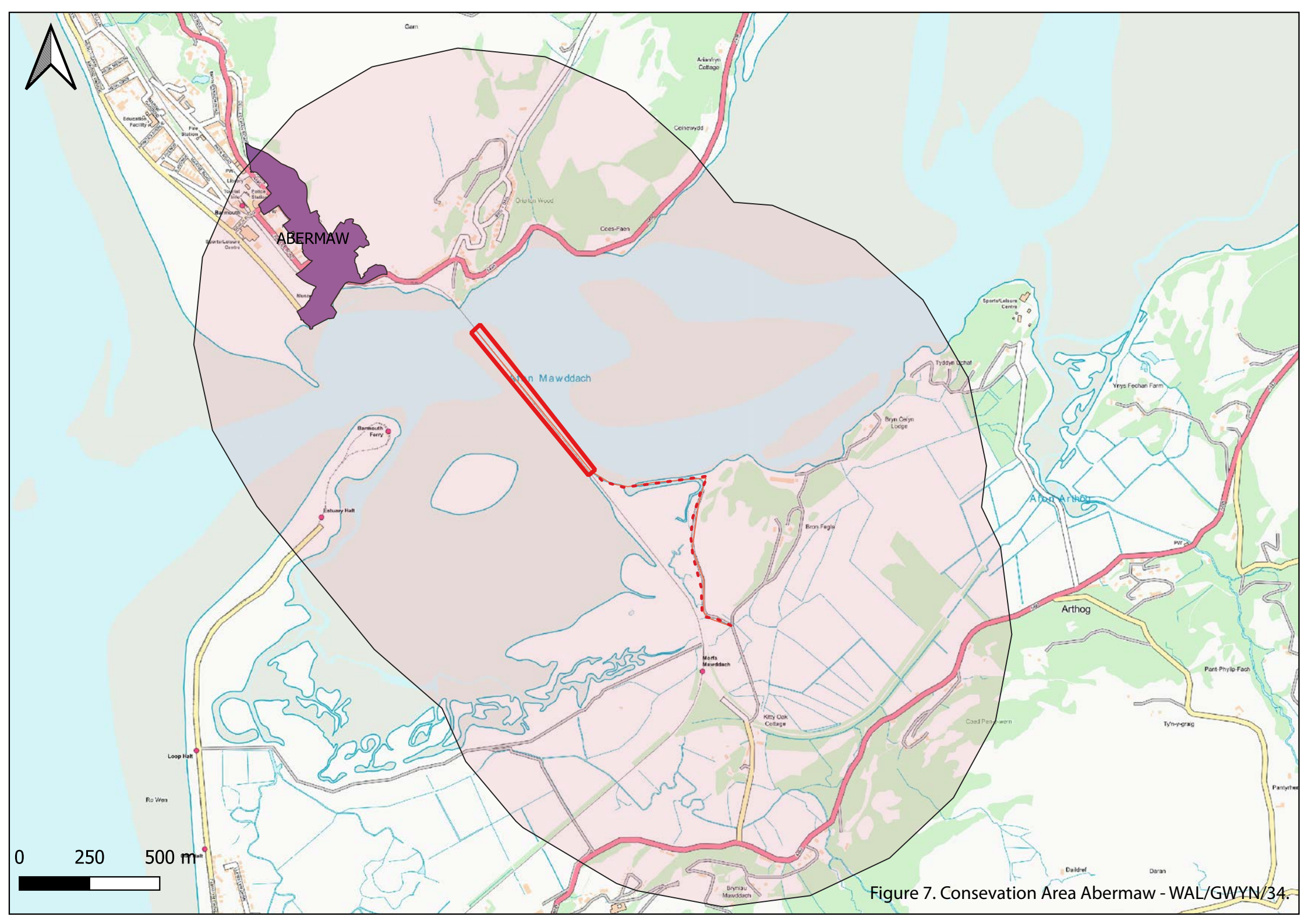


Figure 7. Consevation Area Abermaw - WAL/GWYN/34.

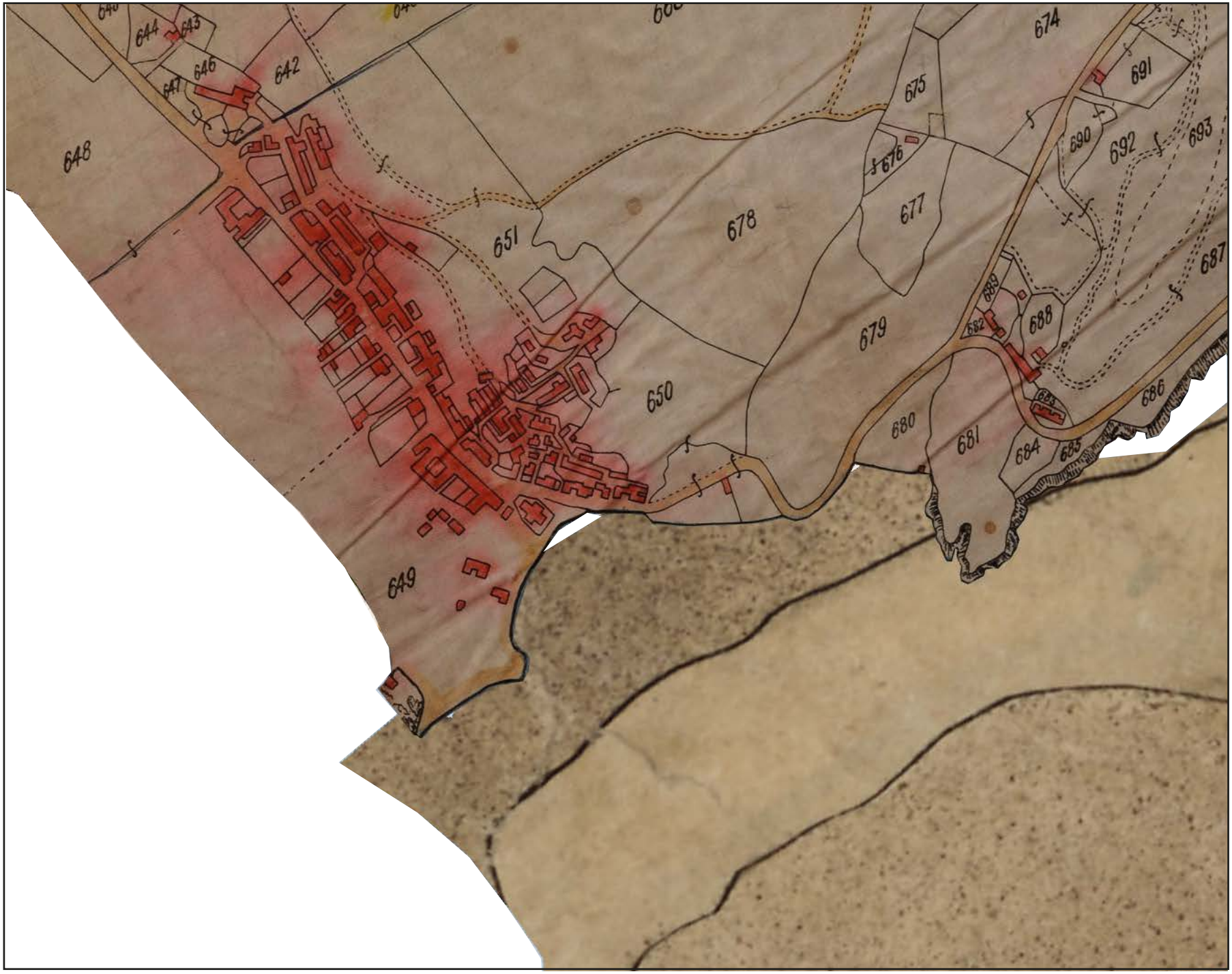


Figure 8. Tithe map Parish of Llanaber in Merionethshire 1841.

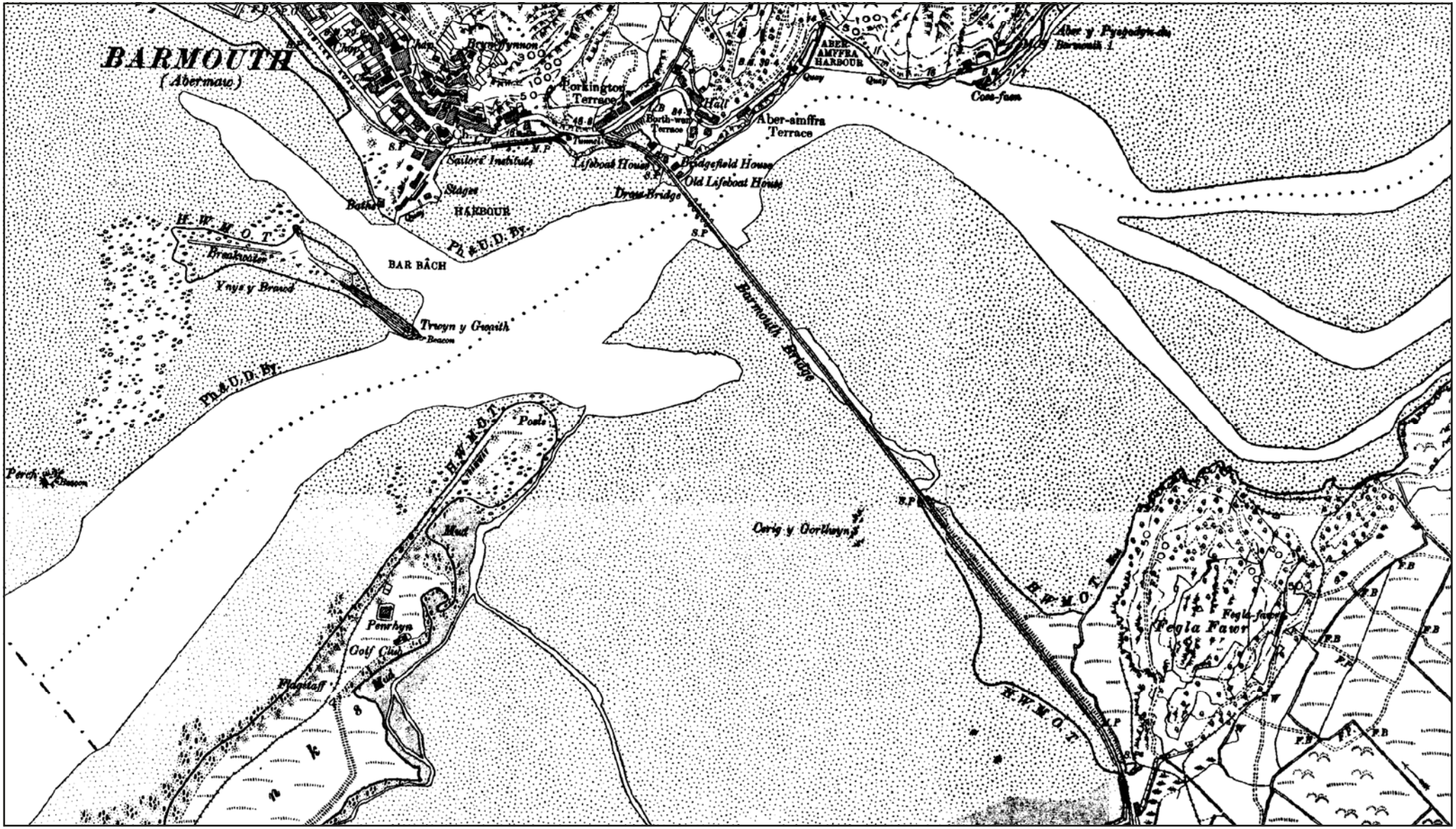


Figure 9. OS County Series 1901 – 10:560.

100m

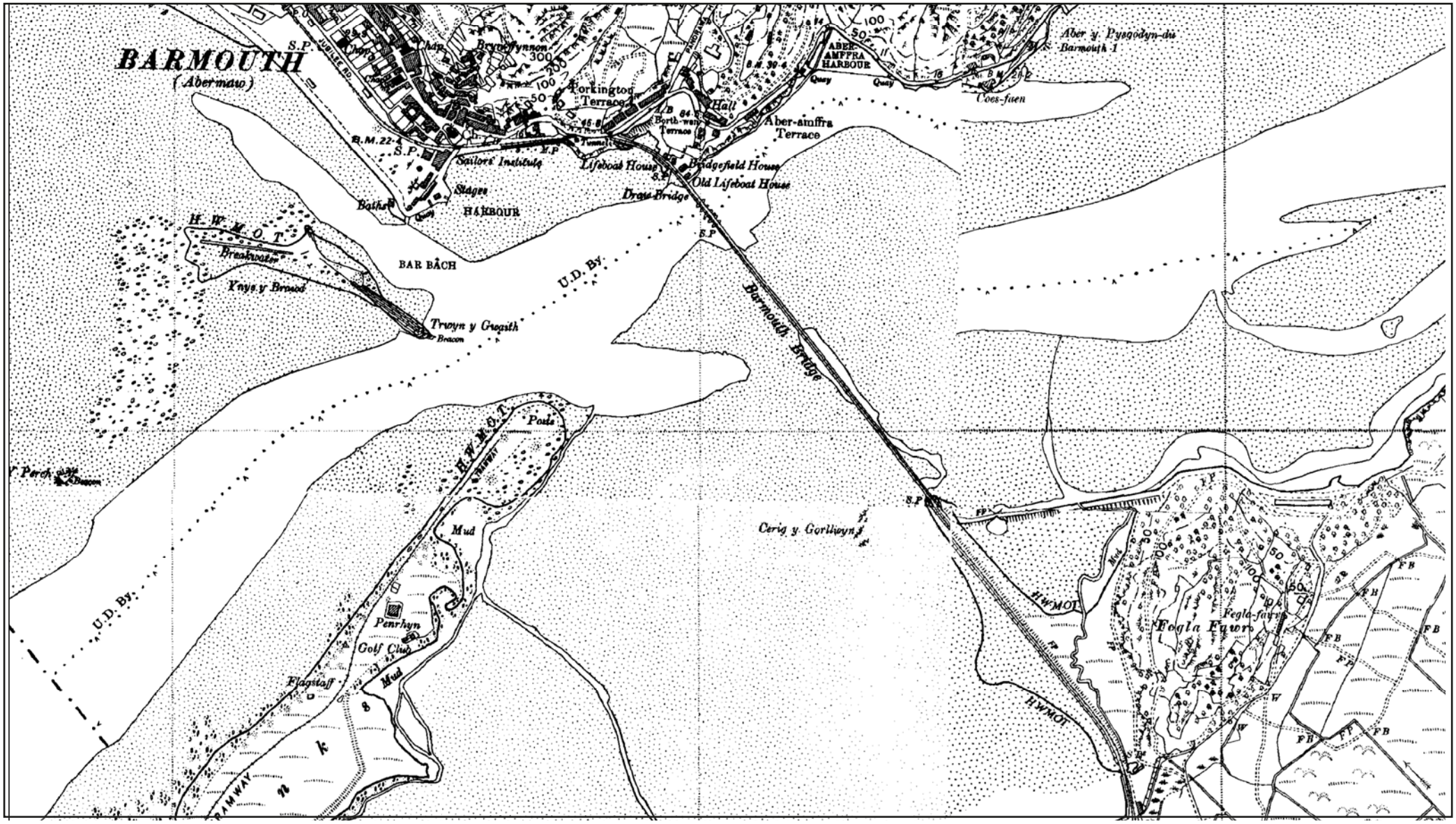


Figure 10. OS County Series 1938 – 10:560.

100m

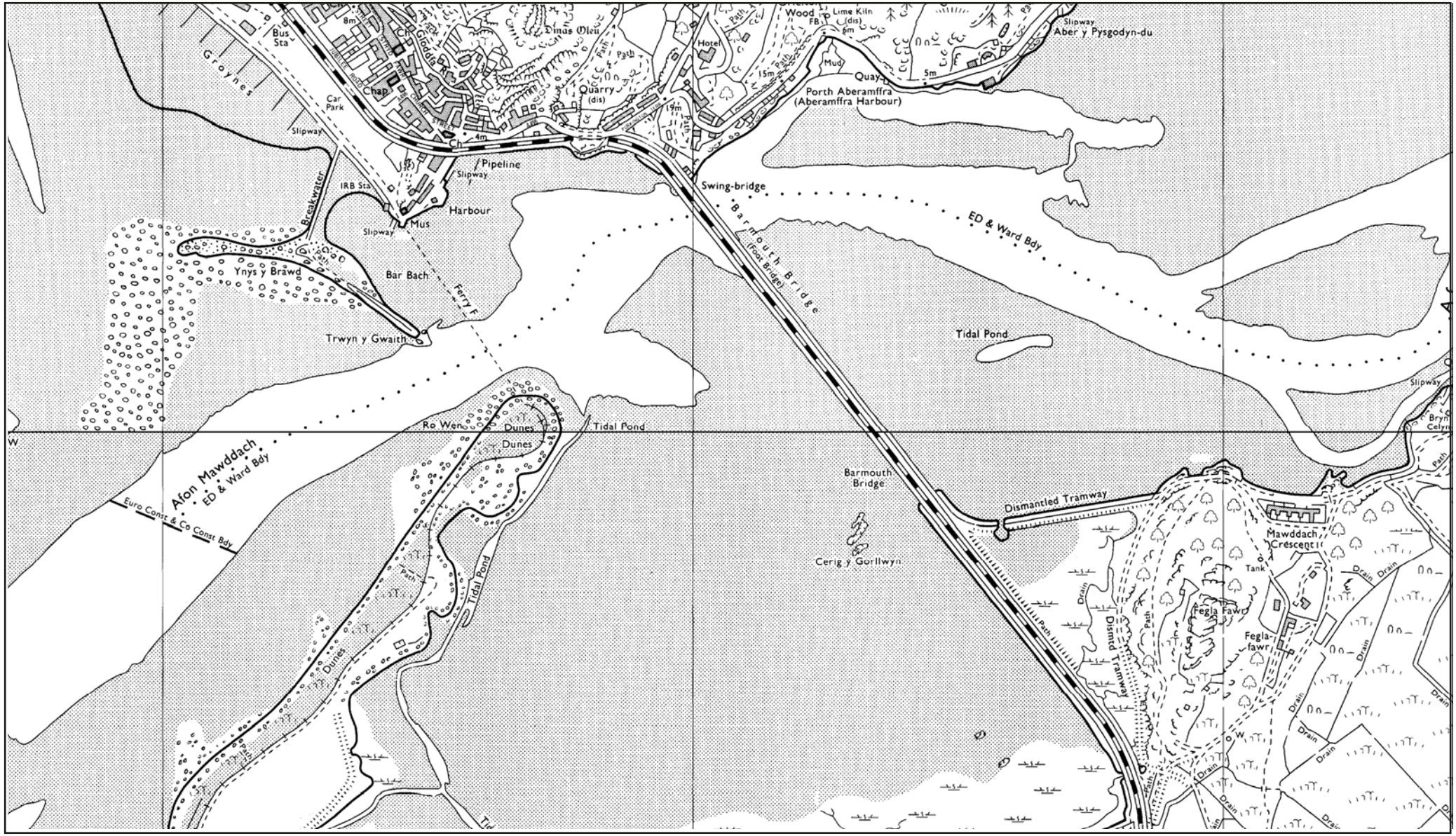


Figure 11, OS Plan 1980-81

100m

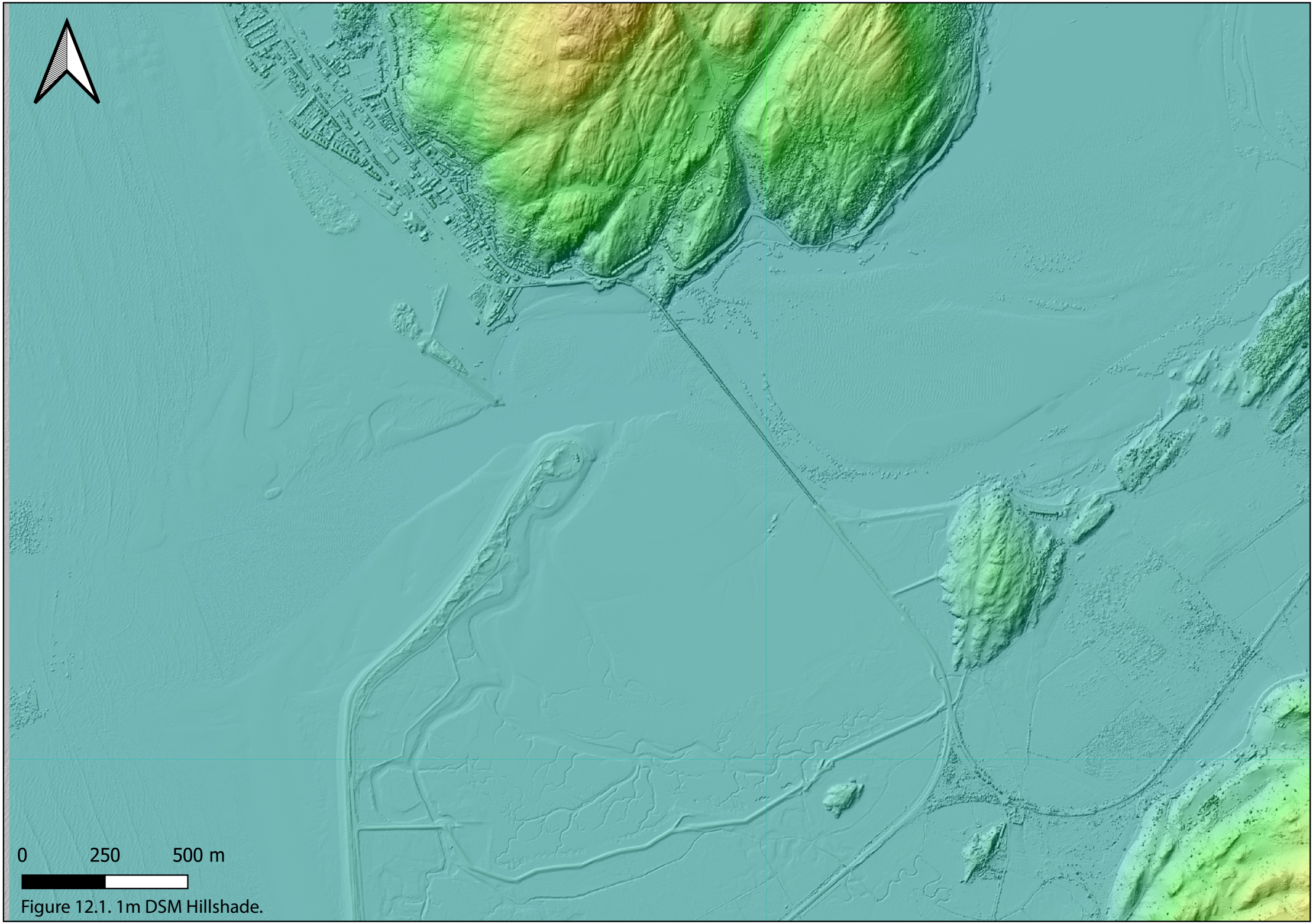


Figure 12.1. 1m DSM Hillshade.

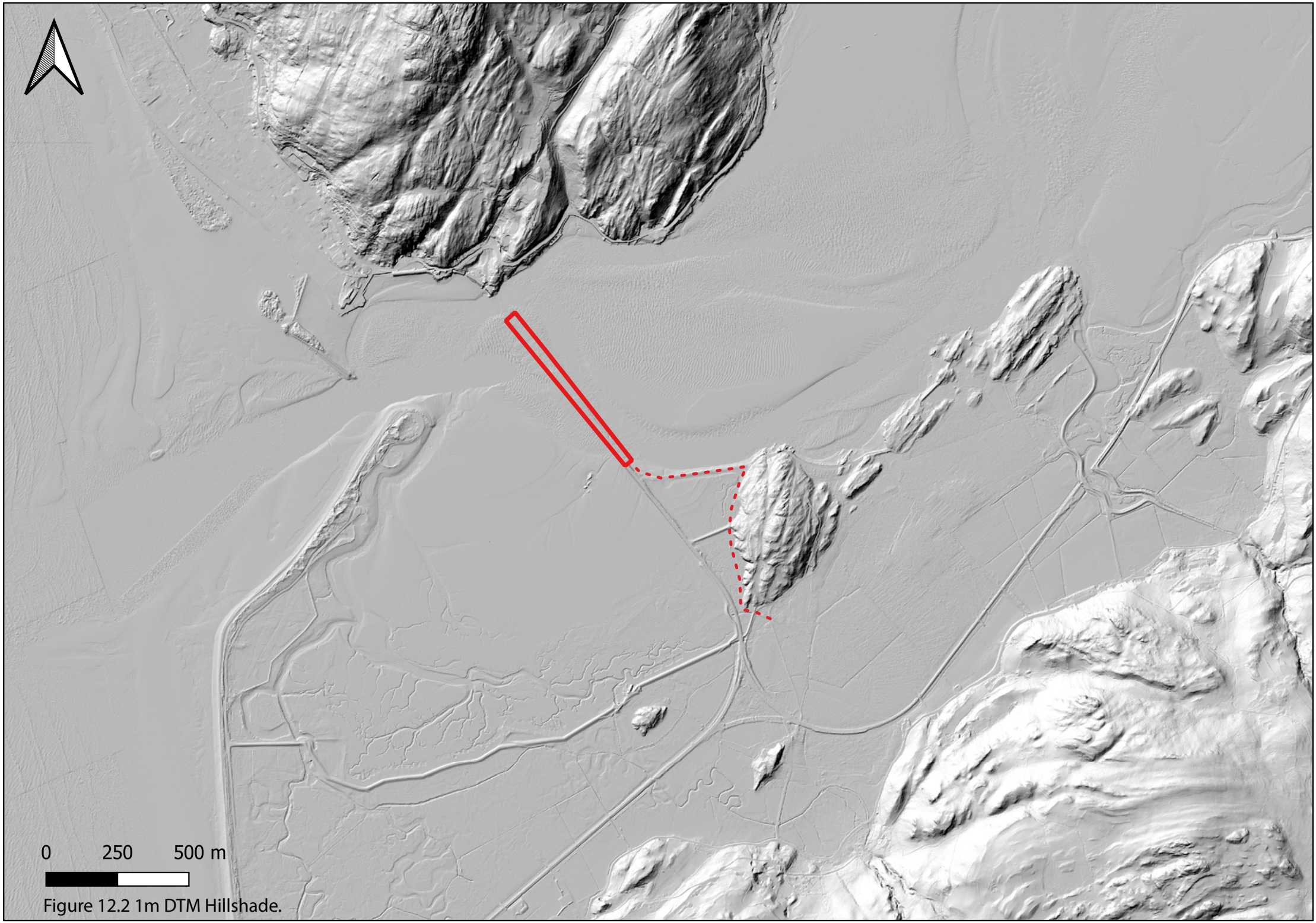


Figure 12.2 1m DTM Hillshade.

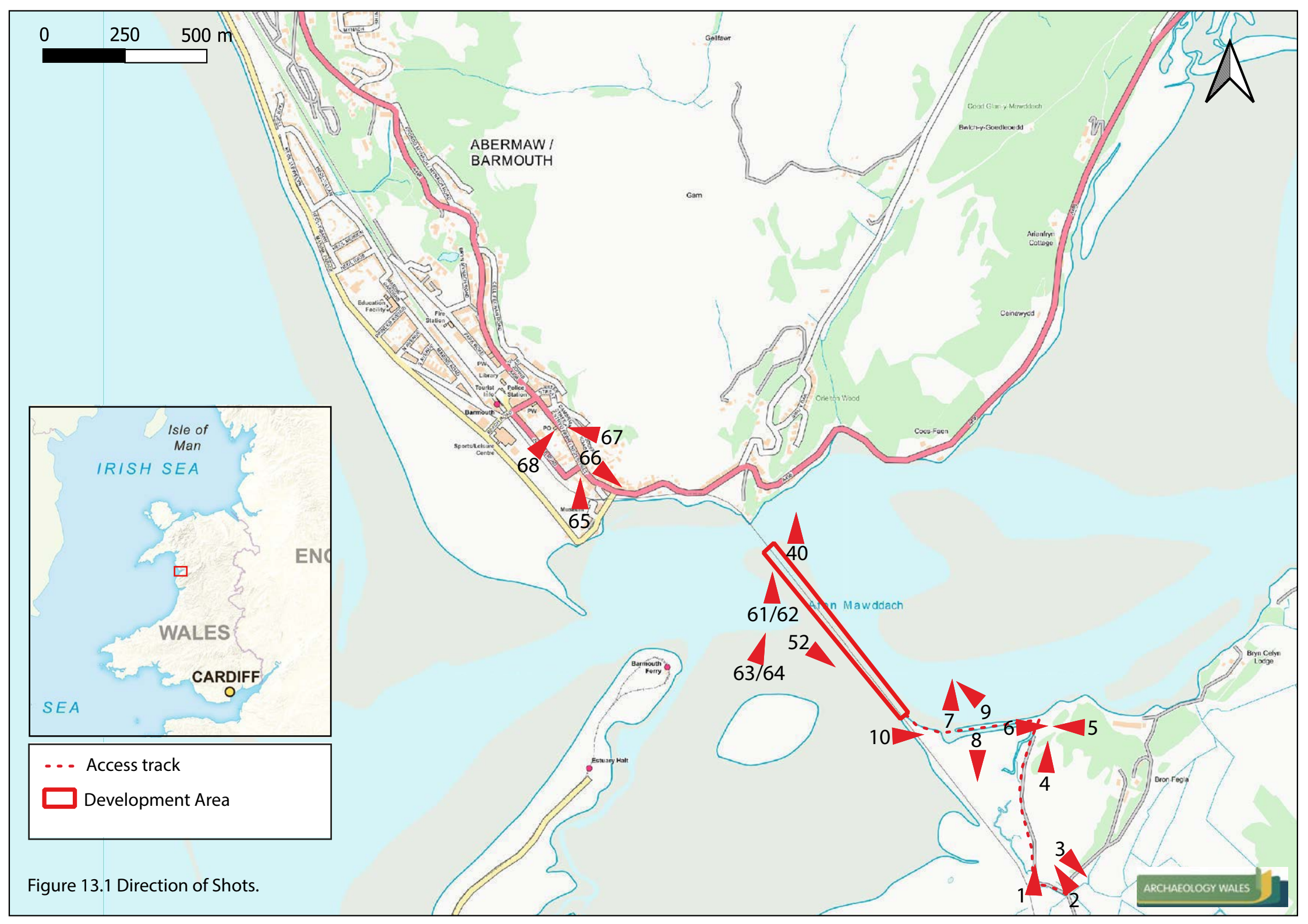


Figure 13.1 Direction of Shots.

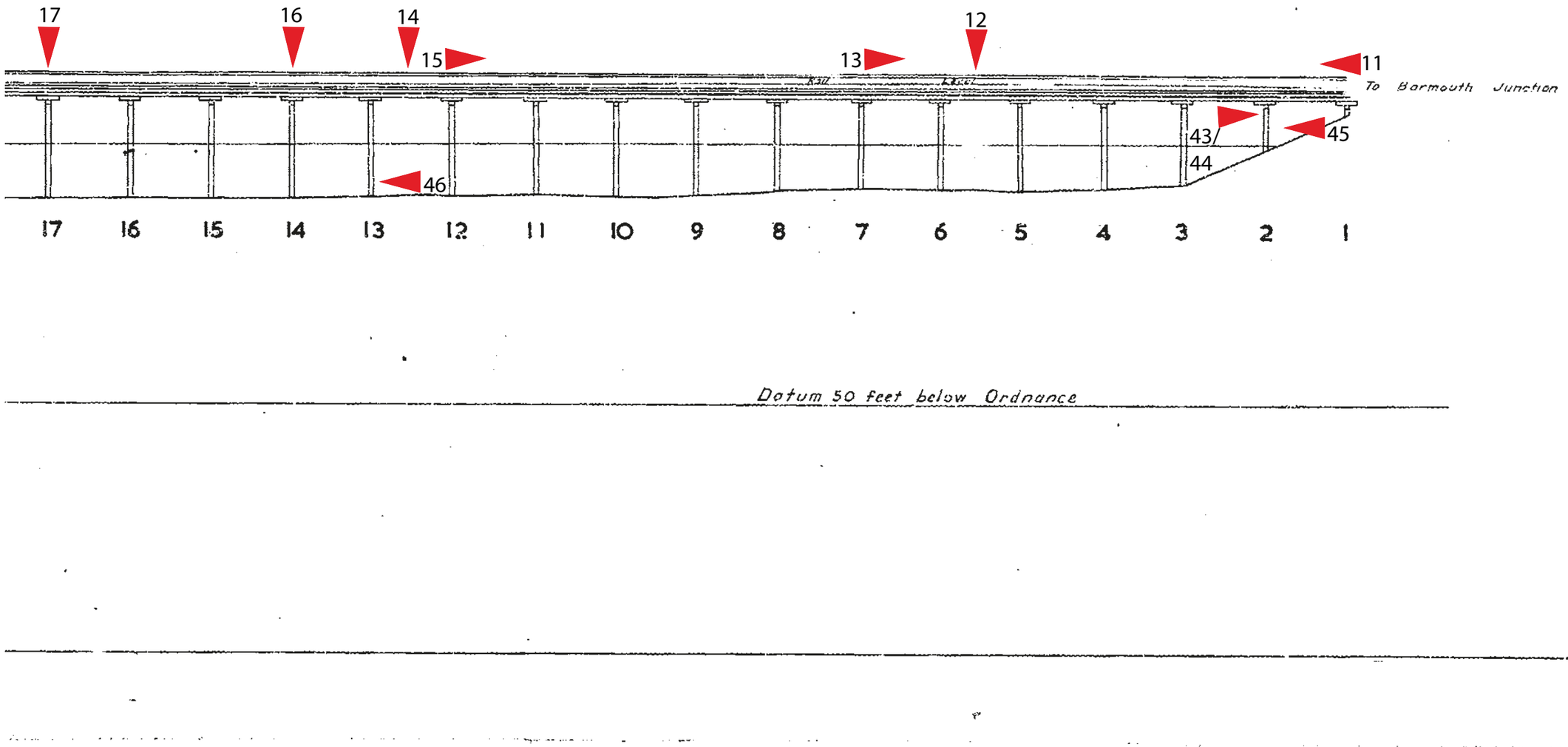


Figure 13.2. Direction of Shots.

Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

ARCHAEOLOGY WALES

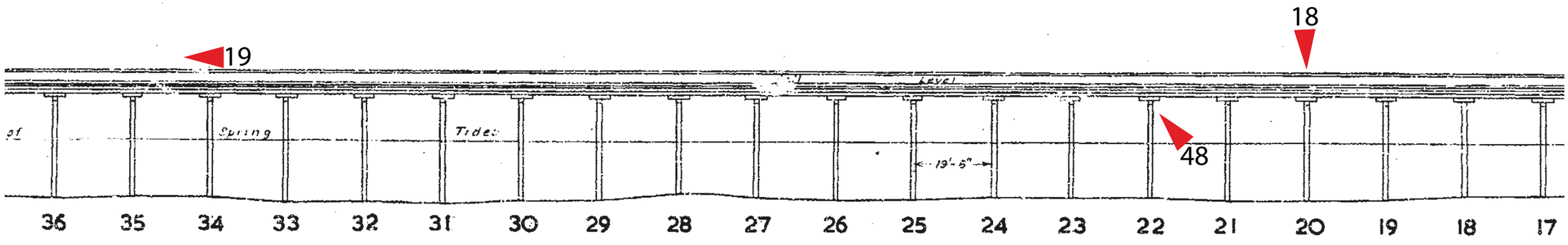


Figure 13.3. Direction of Shots

Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

ARCHAEOLOGY WALES

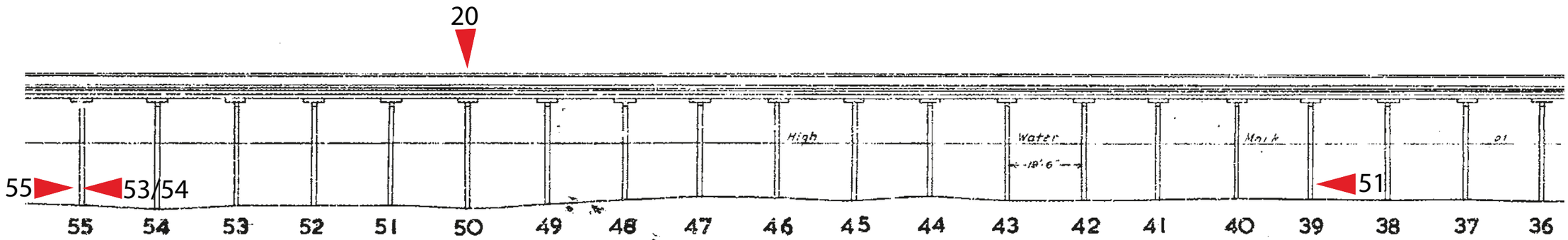


Figure 13.4. Direction of Shots

Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

ARCHAEOLOGY WALES

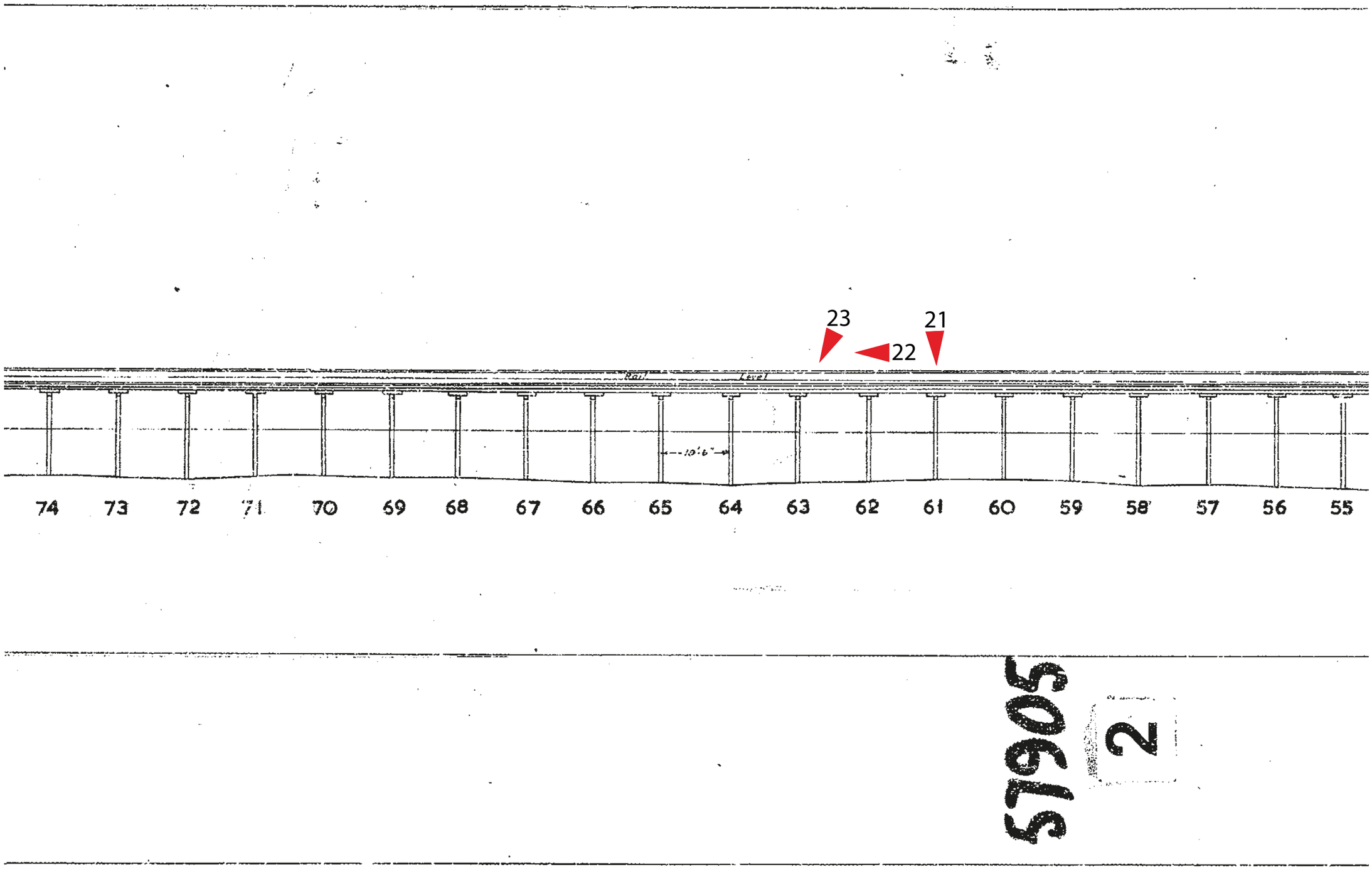


Figure 13.5. Direction of Shots

Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

ARCHAEOLOGY WALES

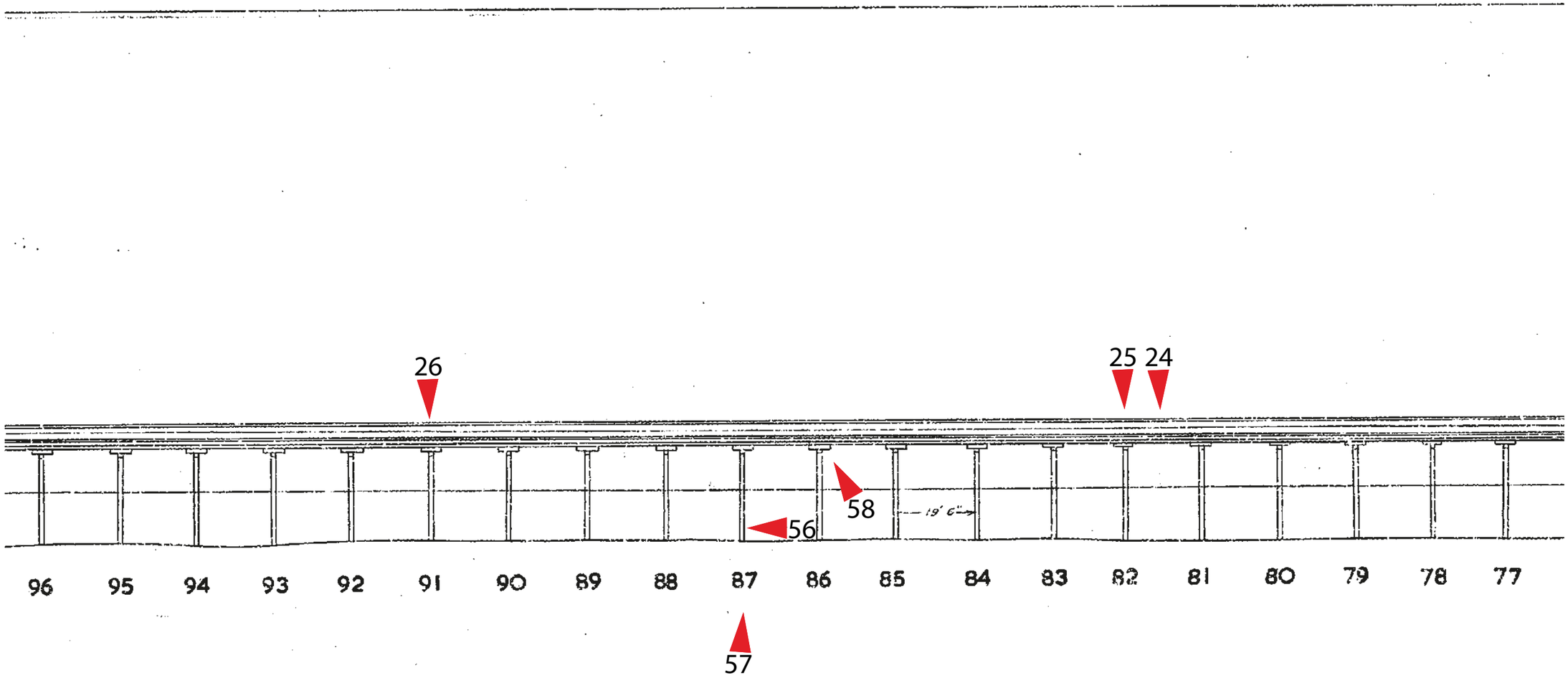


Figure 13.6. Direction of Shots

Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

ARCHAEOLOGY WALES

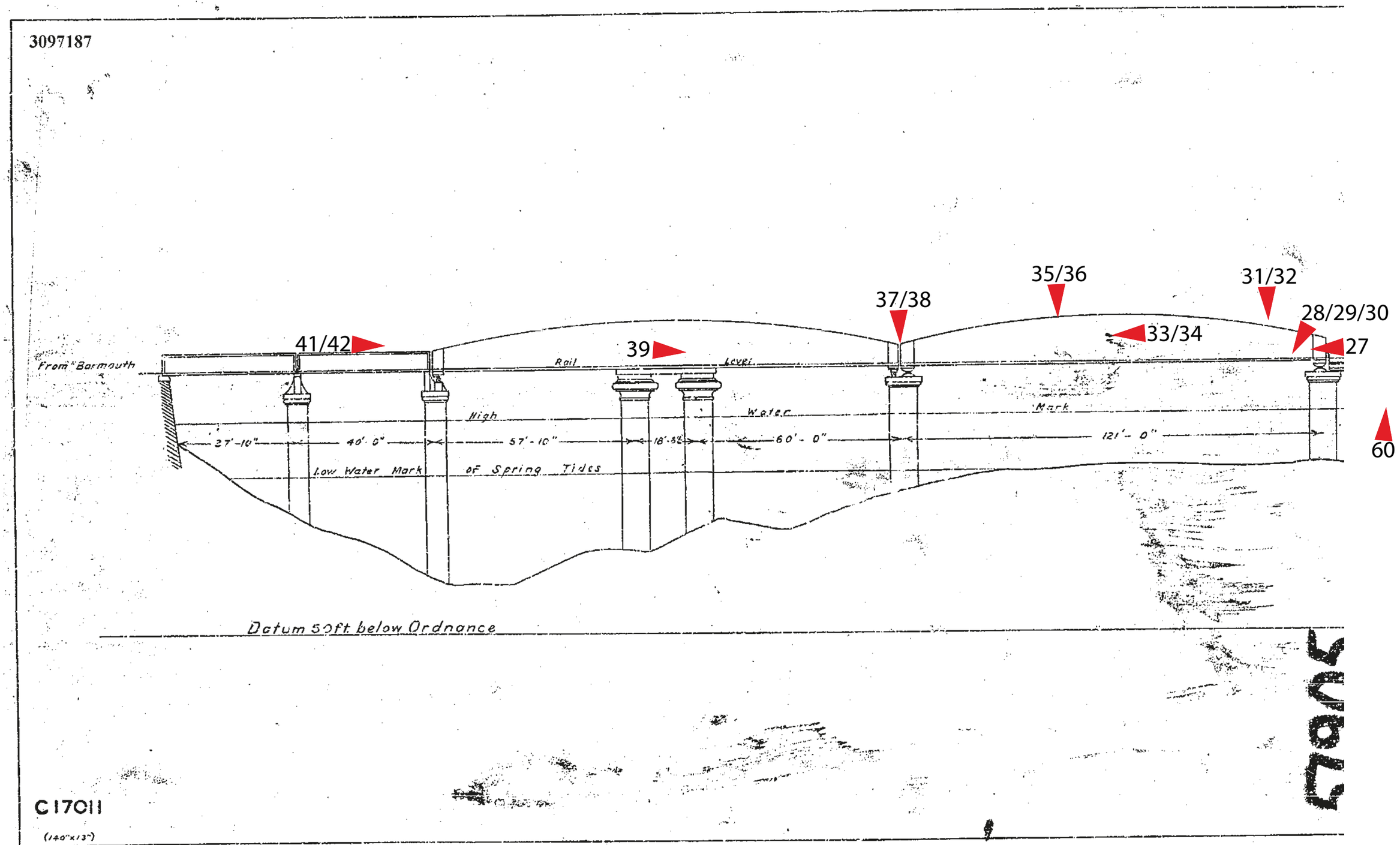


Figure 13.7. Direction of Shots

Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

ARCHAEOLOGY WALES

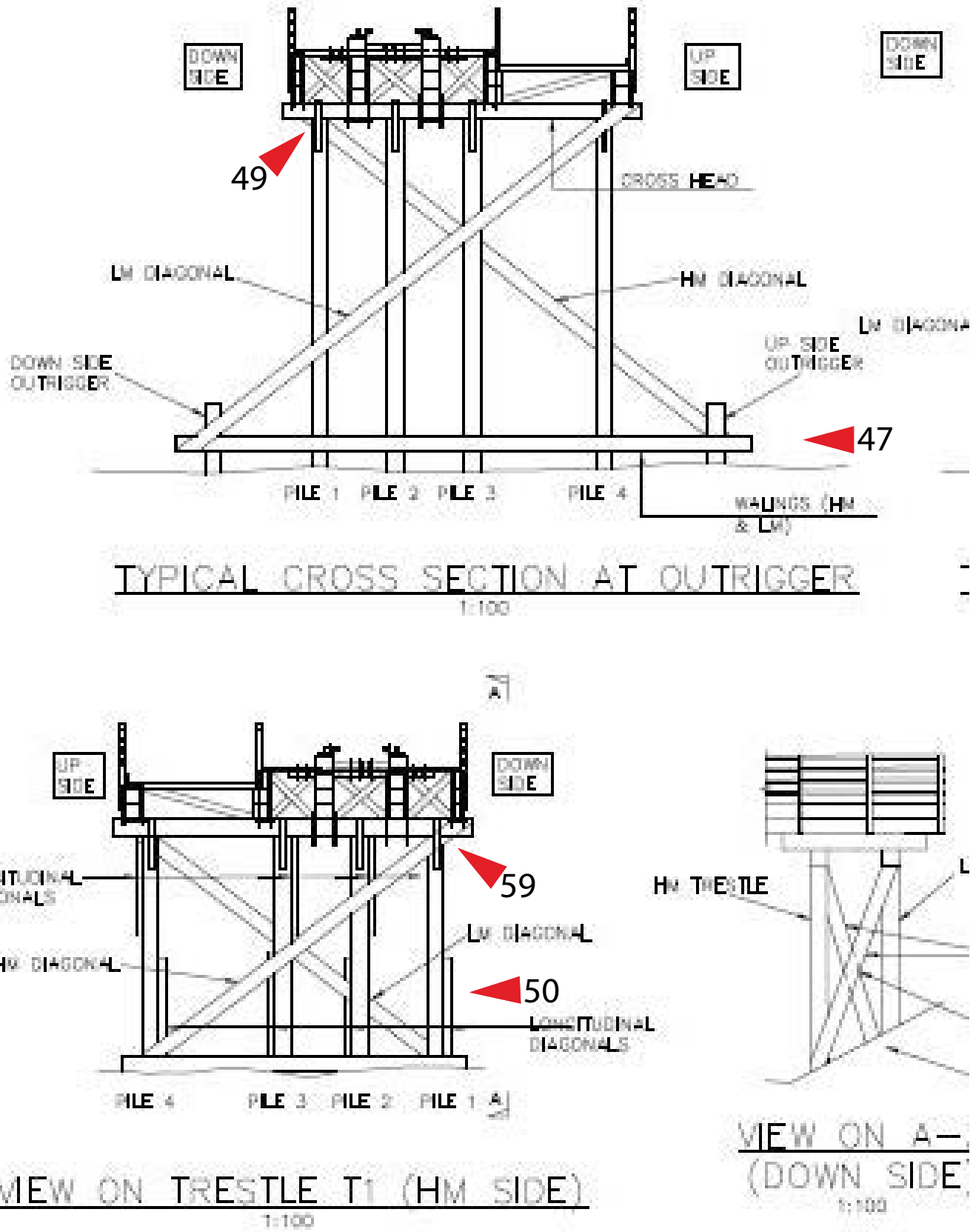


Figure 13.8. Direction of shots showing locations of modern repair work.
Drawing source: Technical drawing showing the locations of 1985 repairwork associated with Barmouth Viaduct.

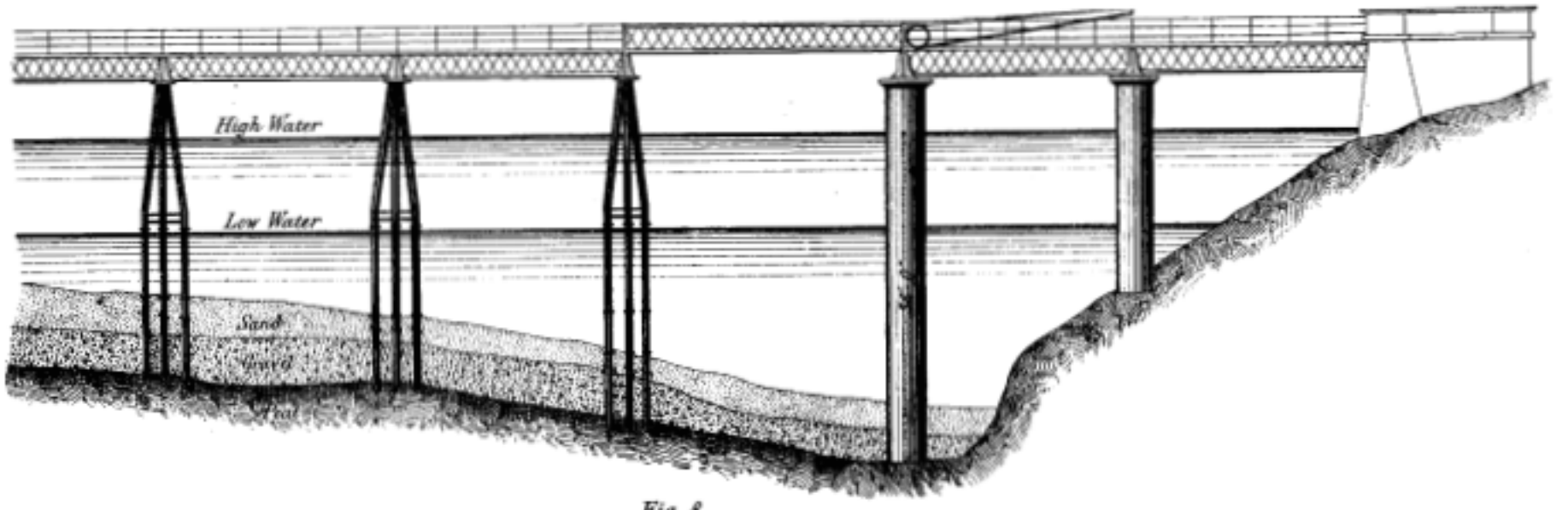


Fig. 8.

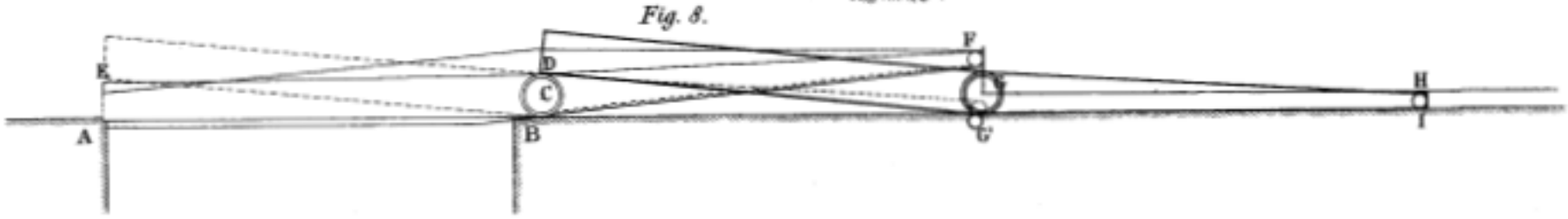


Fig. 7.

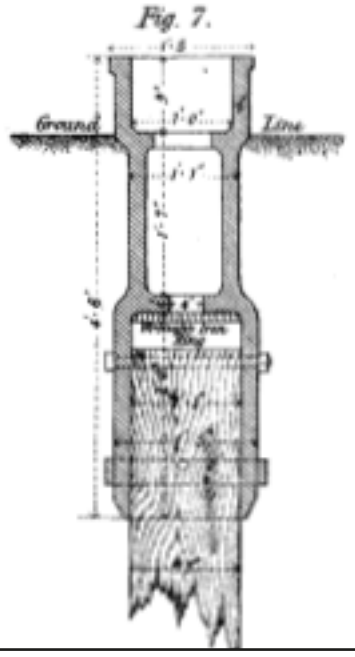


Fig. 4.

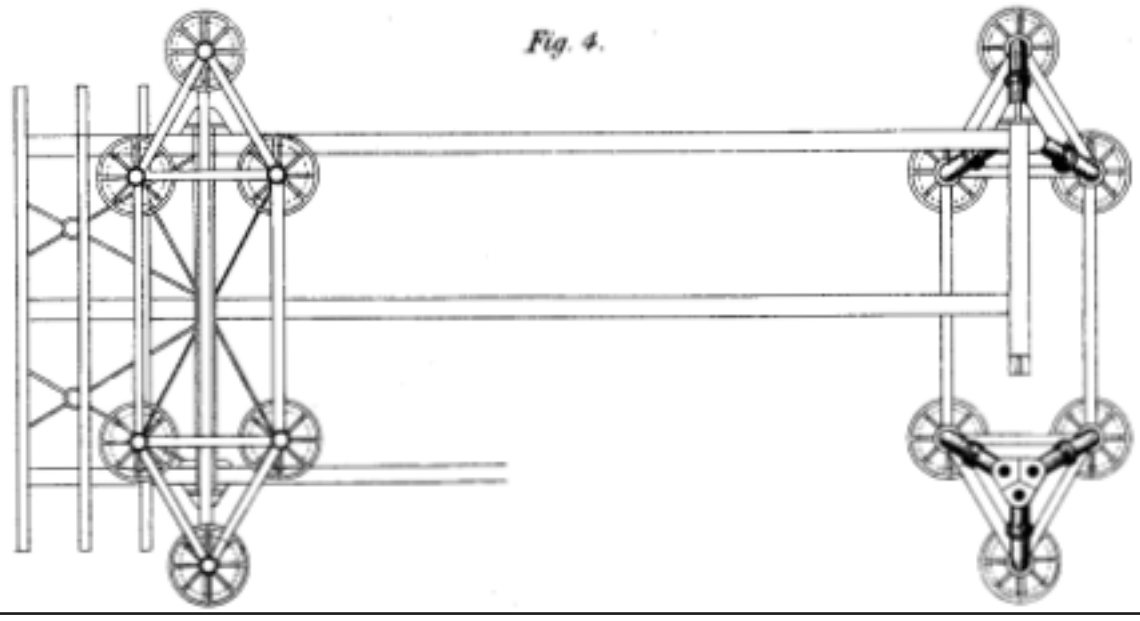


Fig. 2.

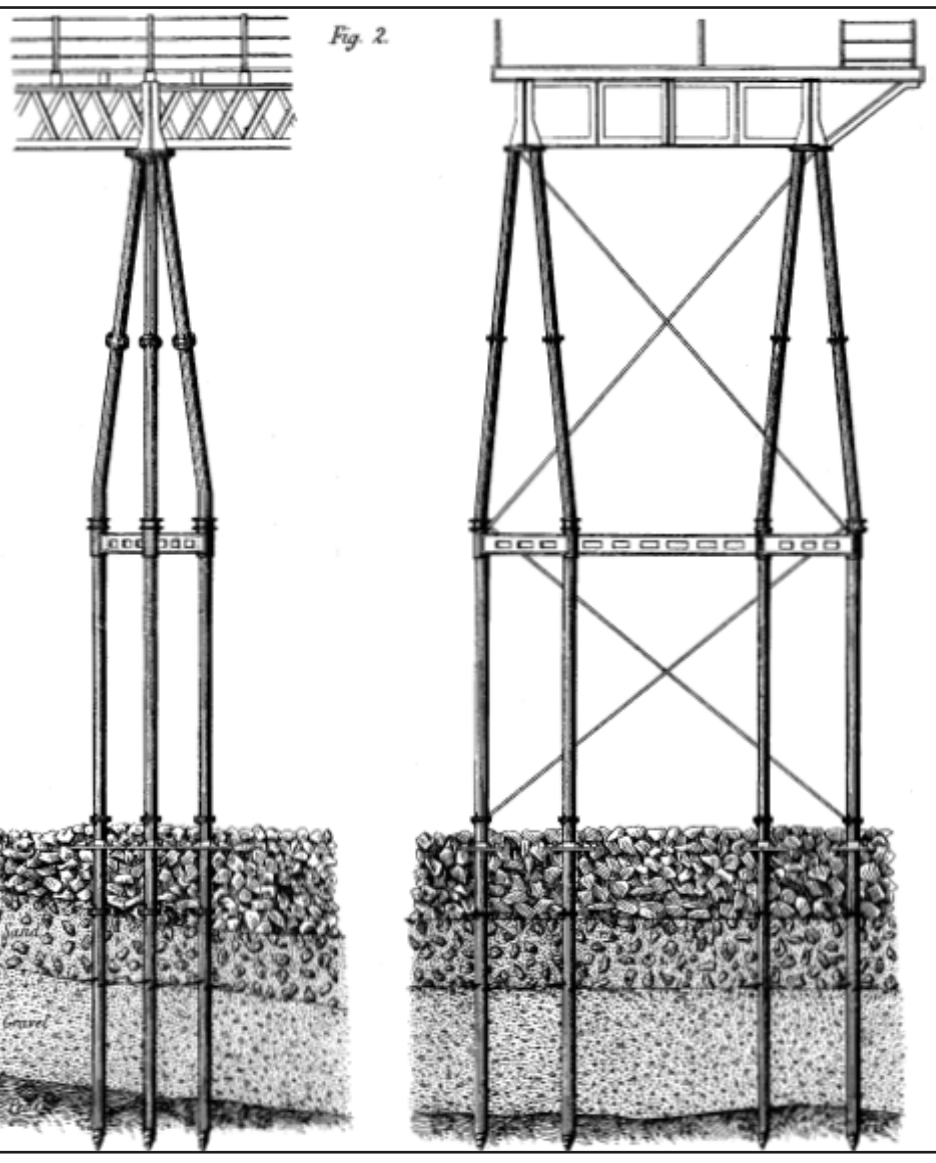


Fig. 5.

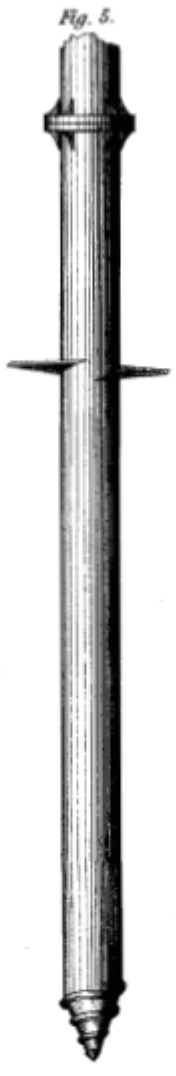


Fig. 6.

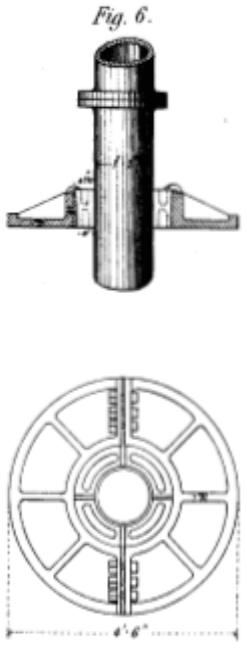


Figure 14.1. Technical drawings of Barmouth Viaduct 1871 (Conybeare 1871).

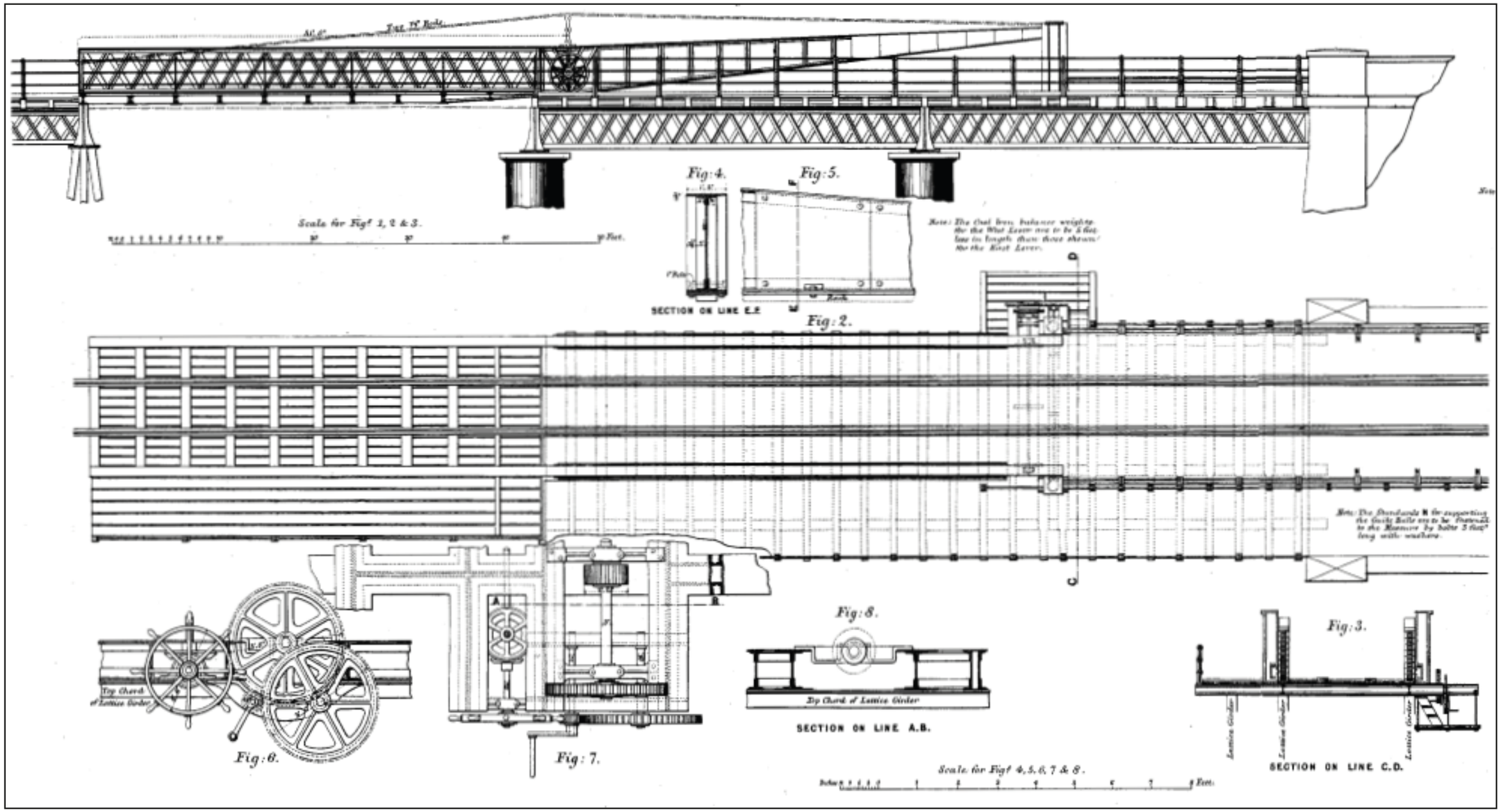


Figure 14.2. Technical drawings of Barmouth Viaduct 1871 (Conybeare 1871).

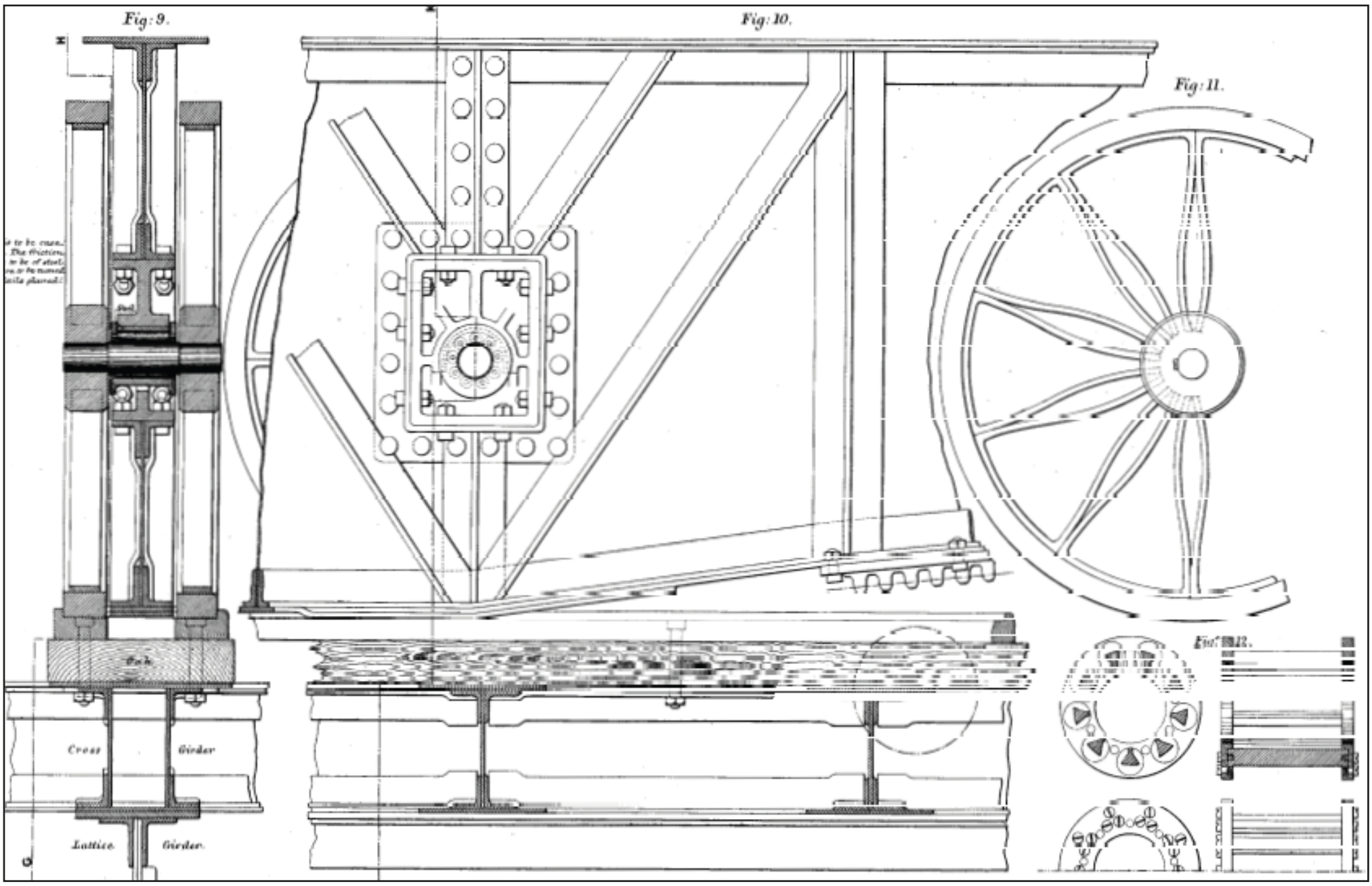


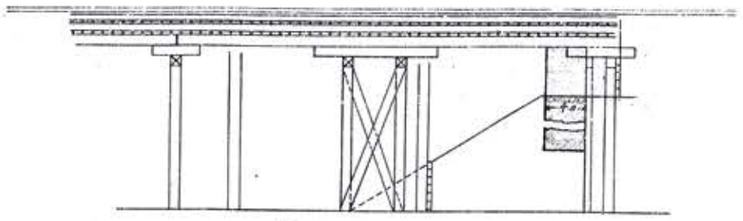
Figure 14.3. Technical drawings of Barmouth Viaduct 1871 (Conybeare 1871).

3123651

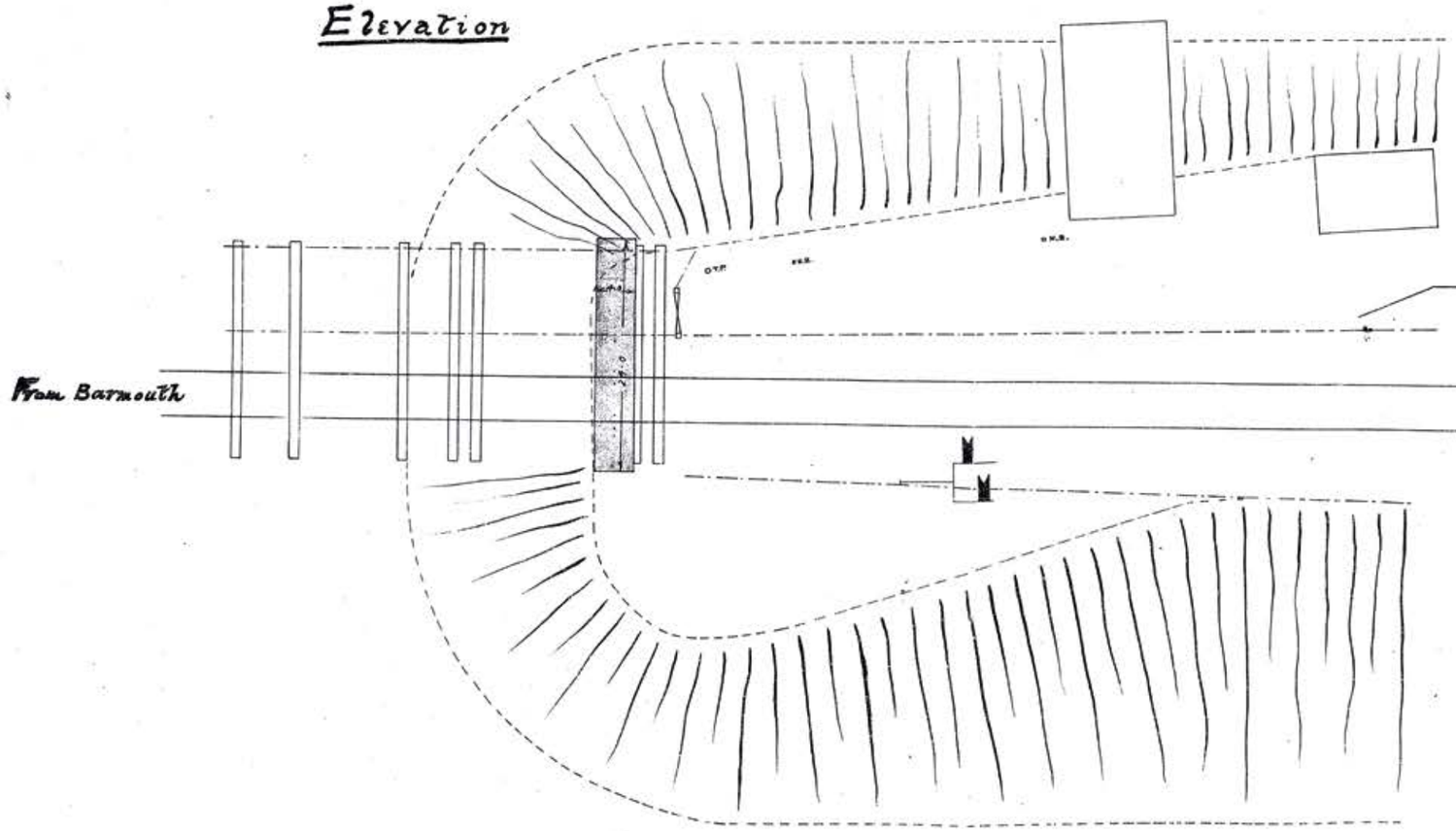
— BARMOUTH BRIDGE —

Survey of End nearest Junction

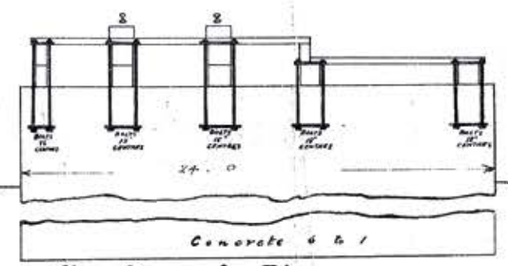
— Scale 8 Feet to an Inch —



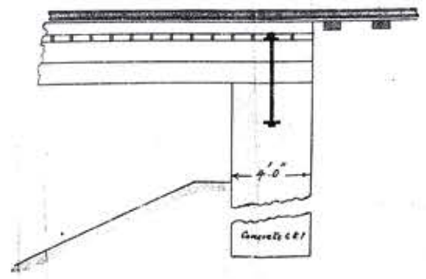
Elevation



— Plan —



Elevation of Pier Scale Four Feet to an Inch.



Section of Pier Scale Four Feet to an Inch.

13

Figure 15.1. Technical drawings of Barmouth Viaduct 1902.

3123652

CAMBRIAN RAILWAYS - BARMOUTH.

PROPOSED SHELTERS FOR VIADUCT.

SCALE 1½ INCHES TO ONE FOOT.

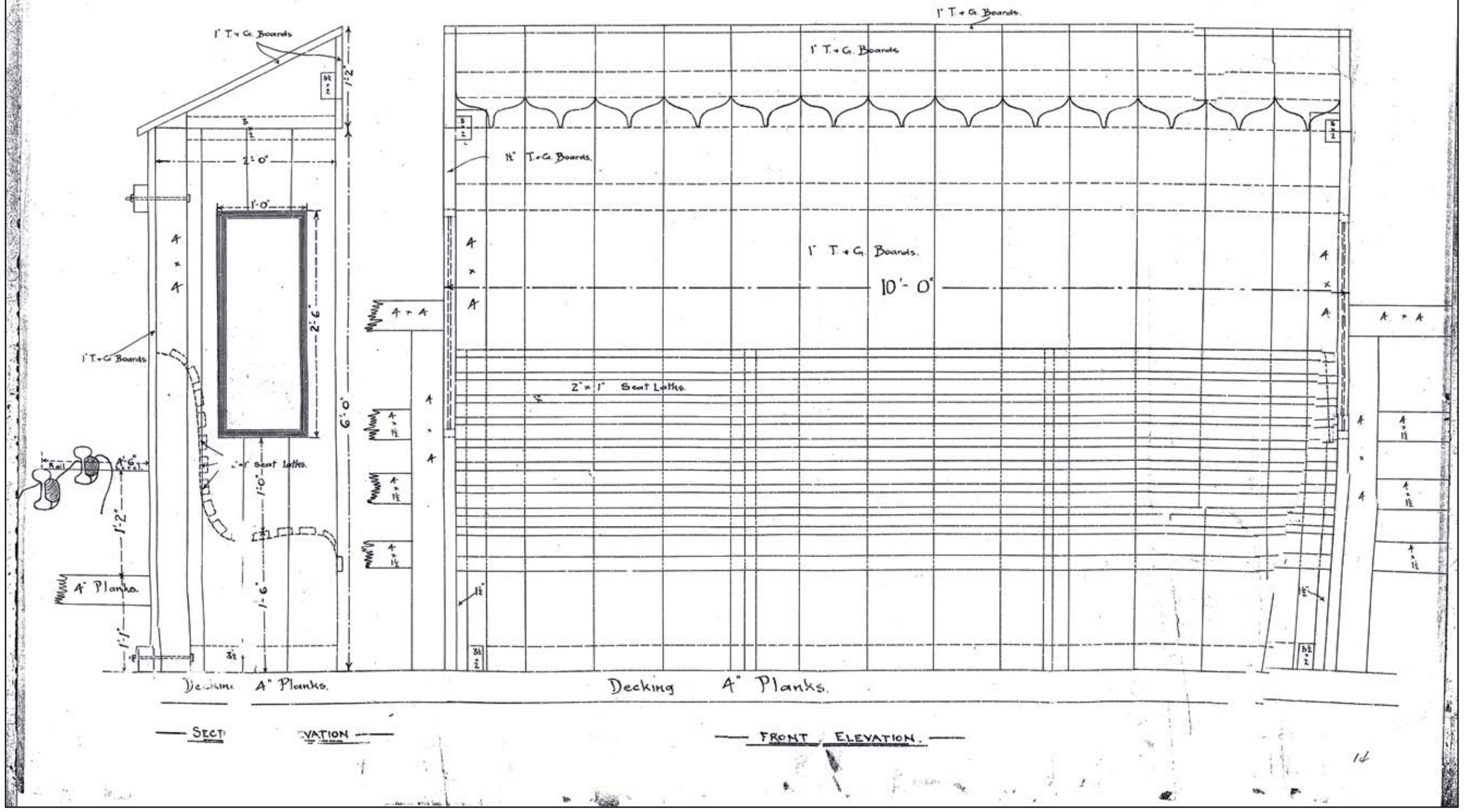


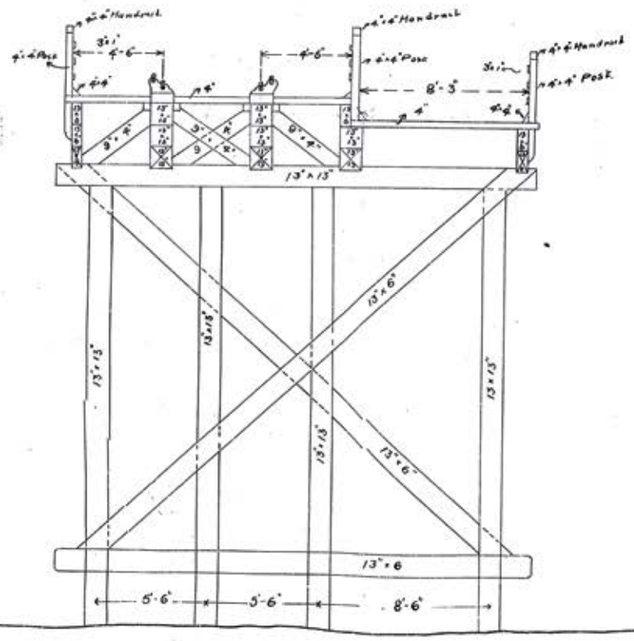
Figure 15.2. Technical drawings of Barmouth Viaduct 1902.

3123653

— BARMOUTH VIADUCT

— DETAILED SECTION OF PROPOSED RECONSTRUCTION

— SCALE 4 FEET TO 1 INCH —



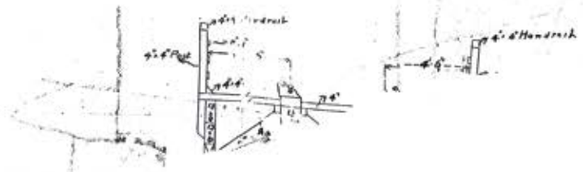
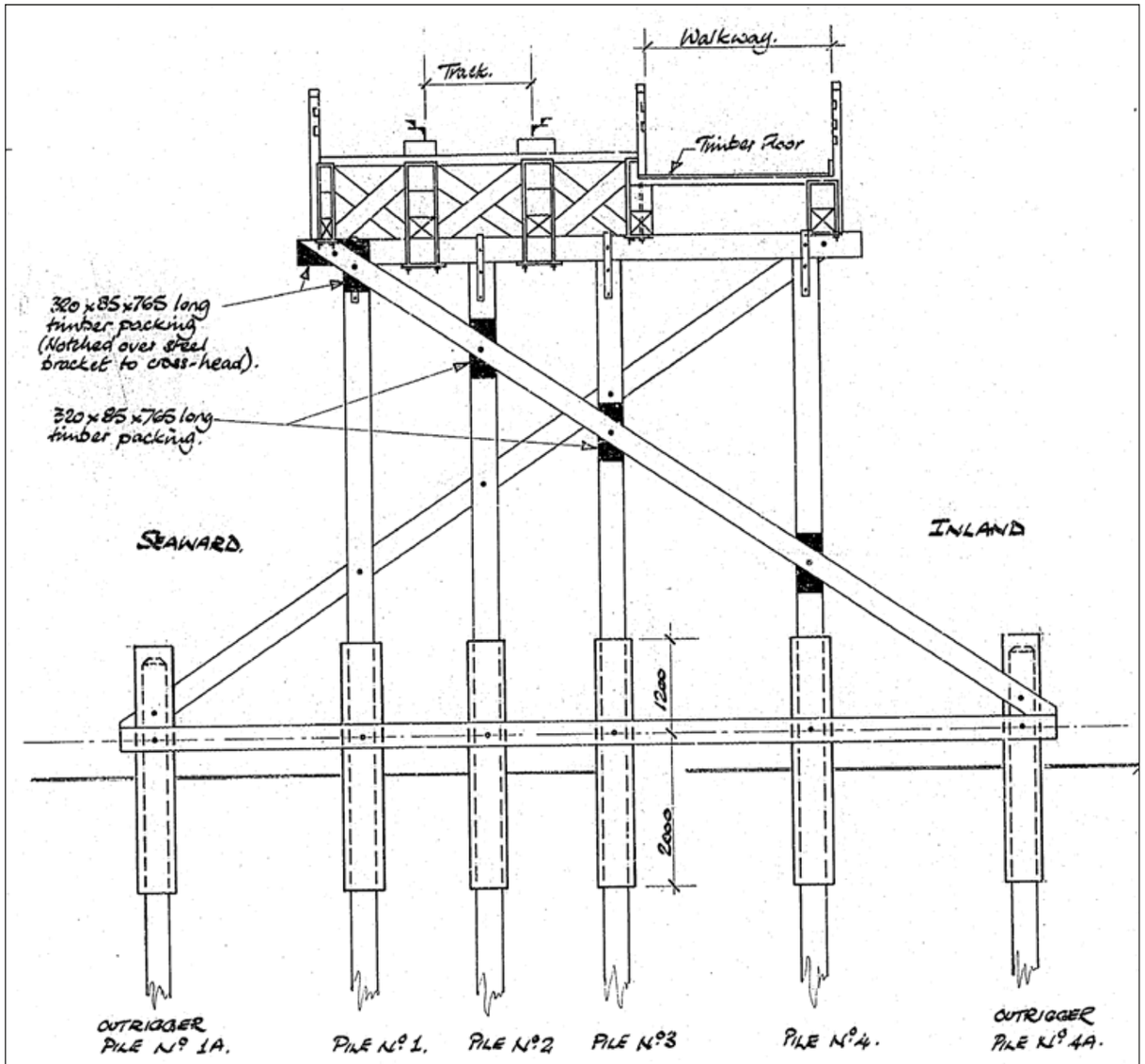
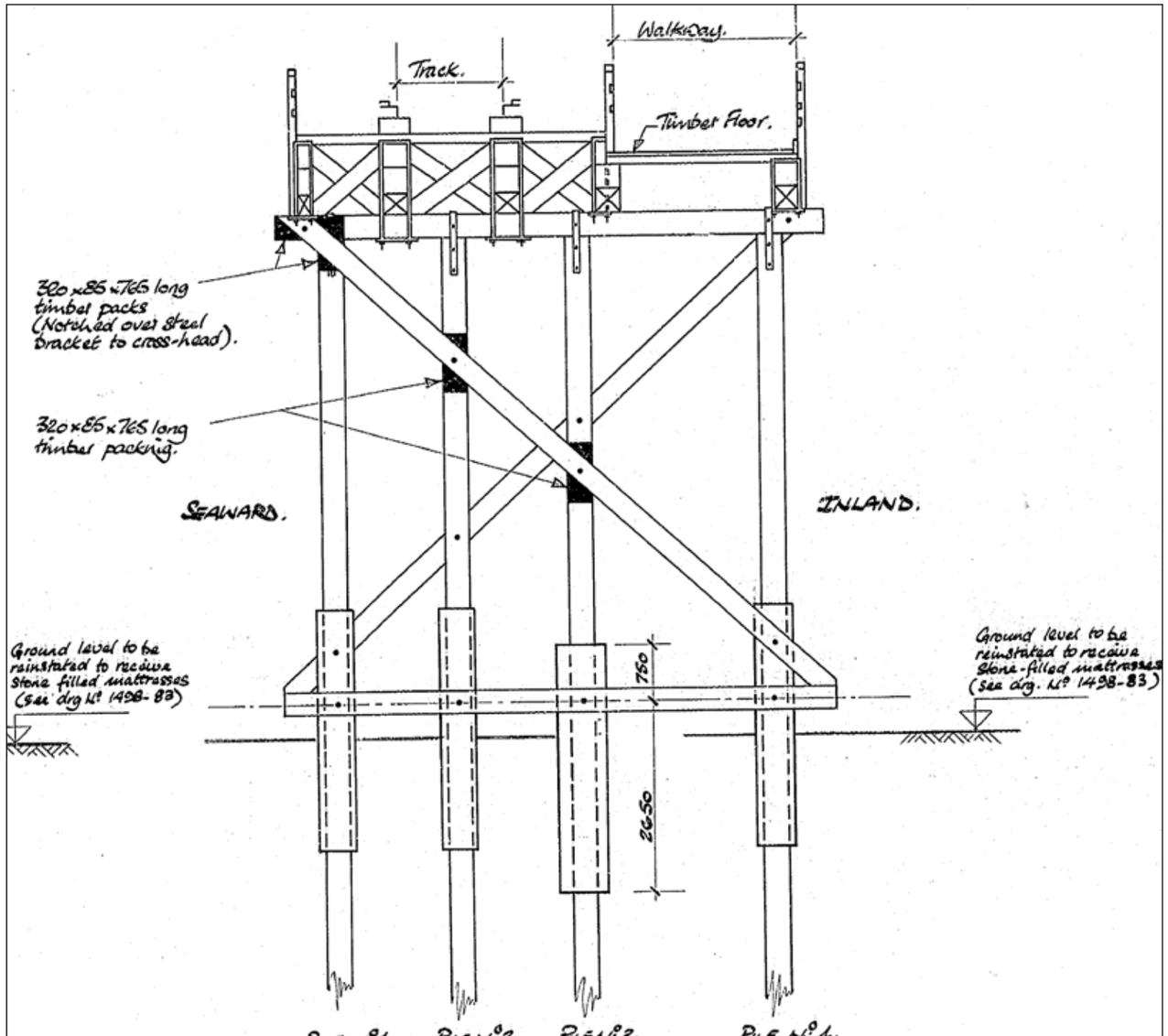


Figure 15.3. Technical drawings of Barmouth Viaduct 1902.

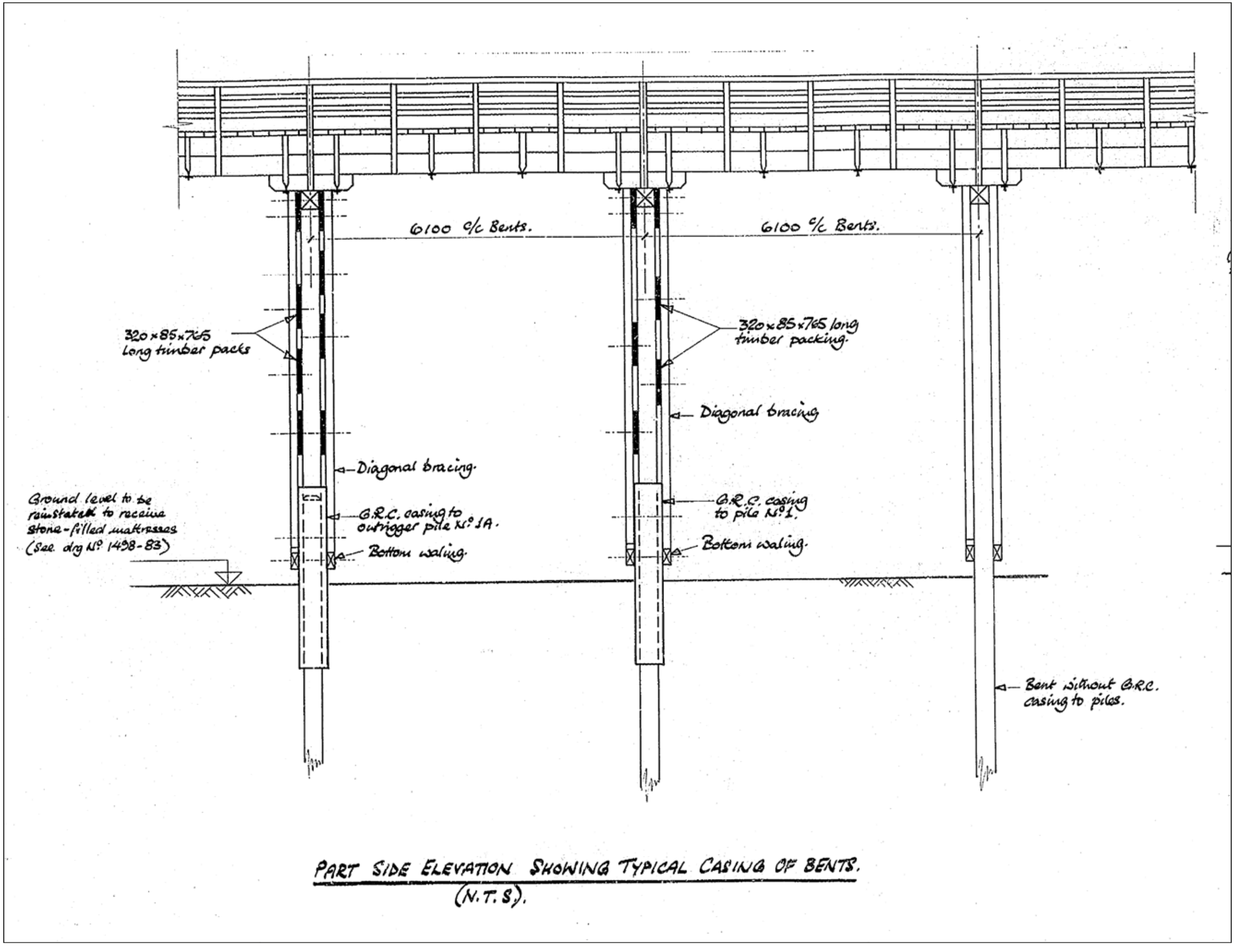


TYPICAL ELEVATION OF BENT WITH OUTRIGGER PILES
(SHOWING ALL PILES CASED WITH STANDARD TYPE CASINGS)
(N.T.S.).
VIEW LOOKING NORTH



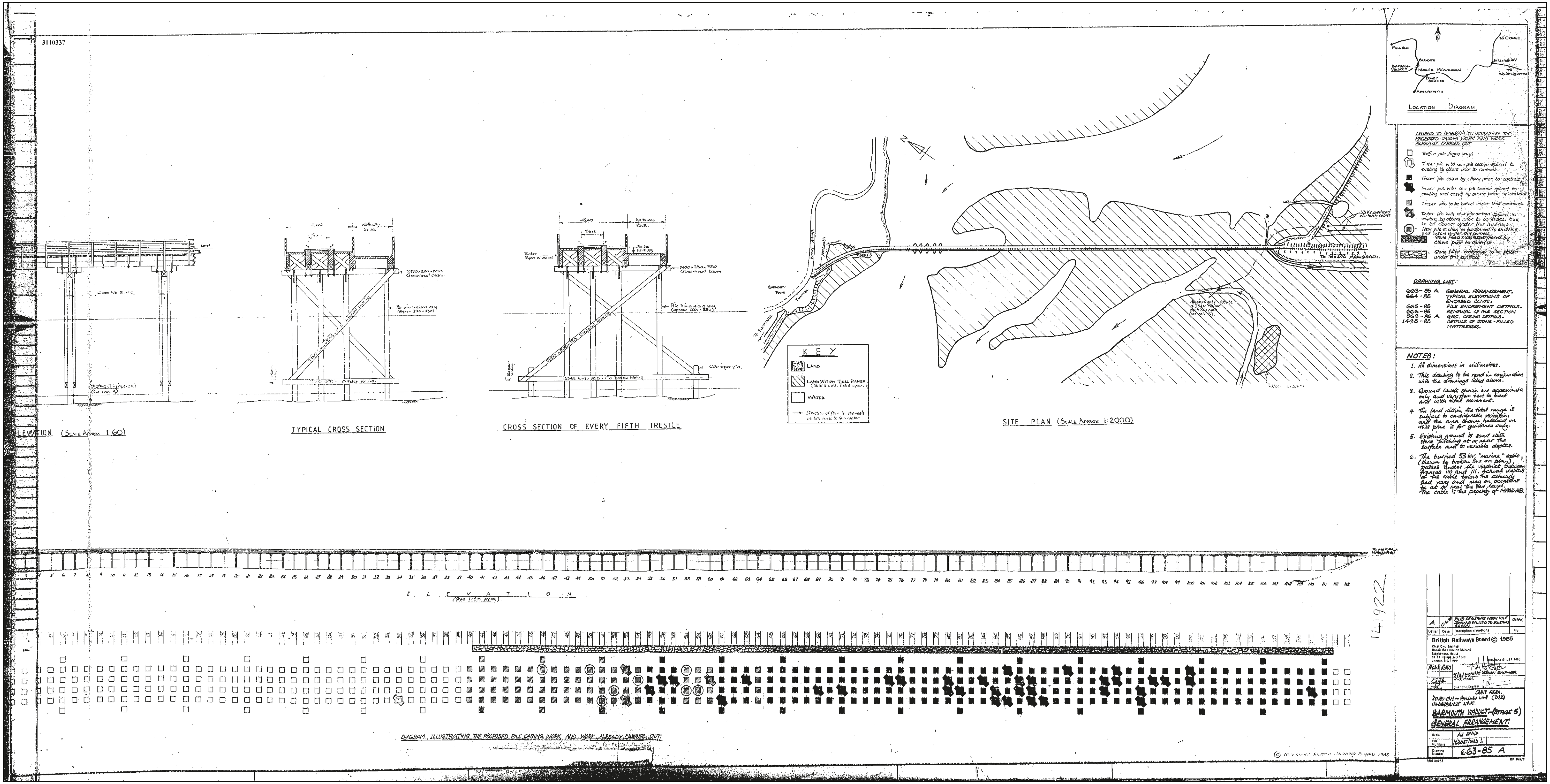
TYPICAL ELEVATION OF 4 PILE BENT.
(SHOWING PILE Nos 1, 2 & 4 CASED WITH STANDARD TYPE CASINGS AND PILE No 3 CASED WITH SPECIAL CASING TO SPLICED PILE.)
(N.T.S.).
VIEW LOOKING NORTH.

Figure 16.1. Technical drawings of repair and replacement works carried out on Barmouth Viaduct in 1985.



PART SIDE ELEVATION SHOWING TYPICAL CASING OF BENTS.
(N.T.S).

Figure 16.2. Technical drawings of repair and replacement works carried out on Barmouth Viaduct in 1985.



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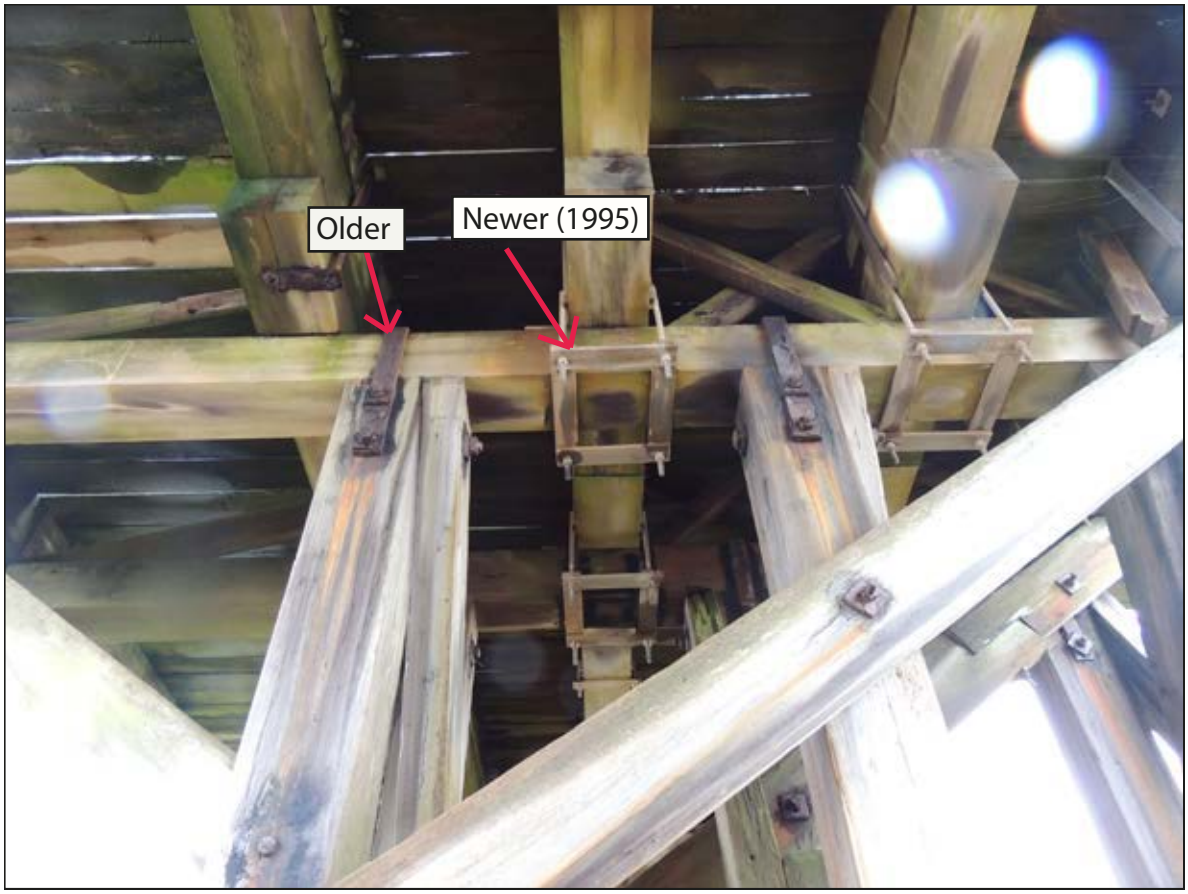

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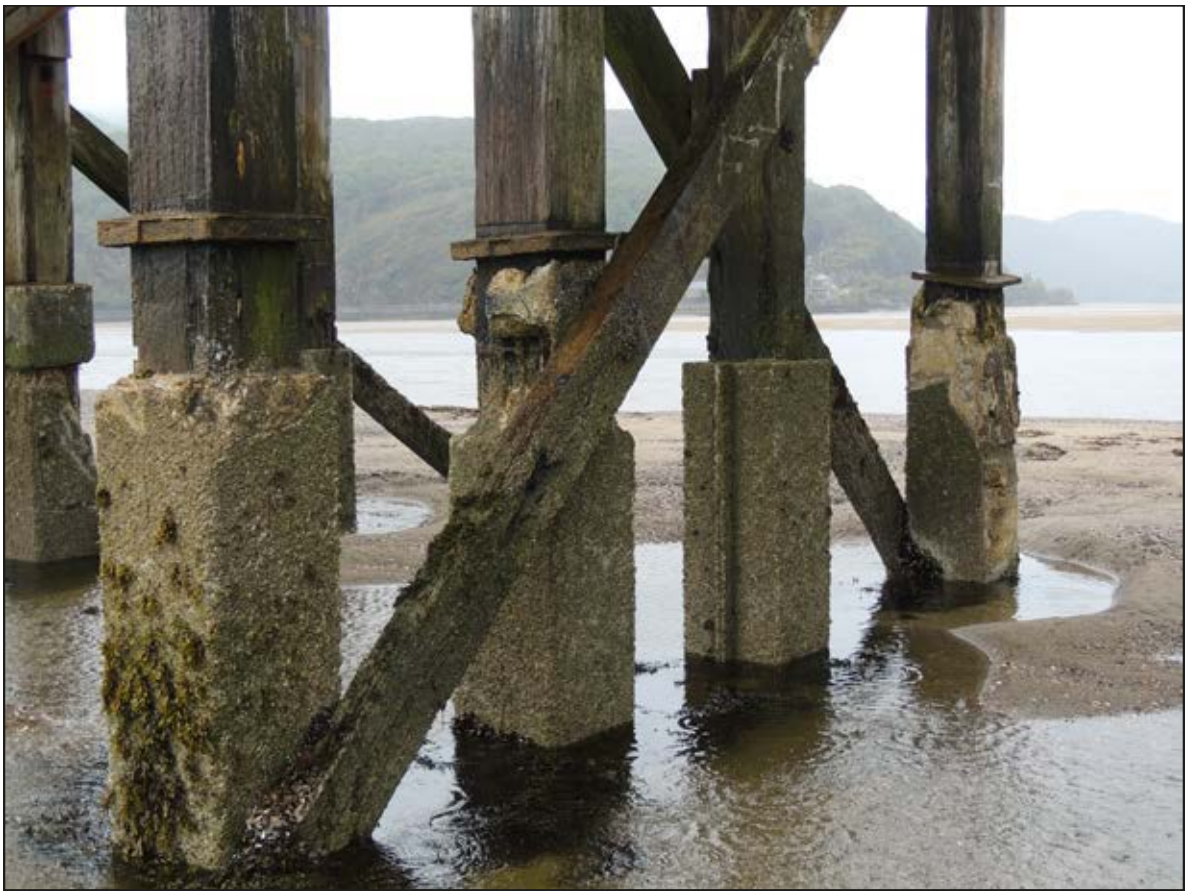

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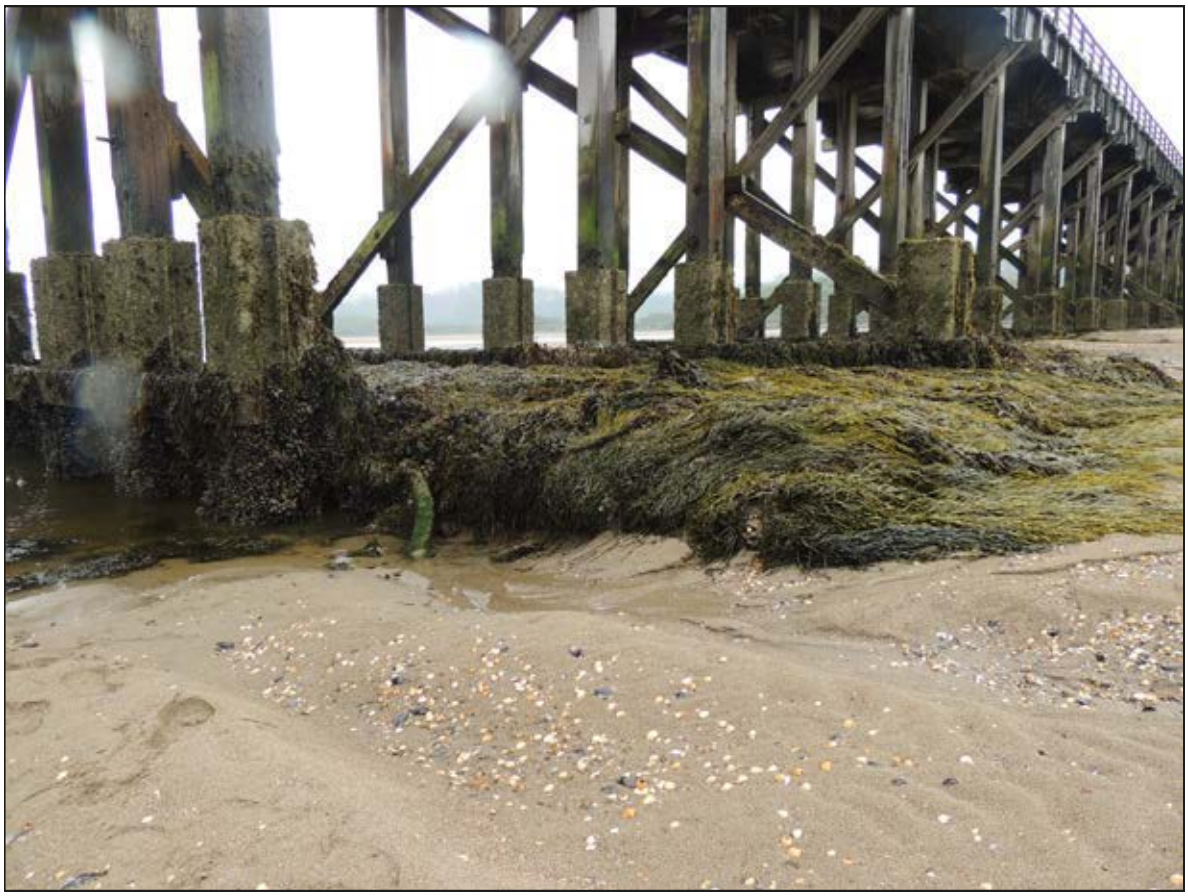

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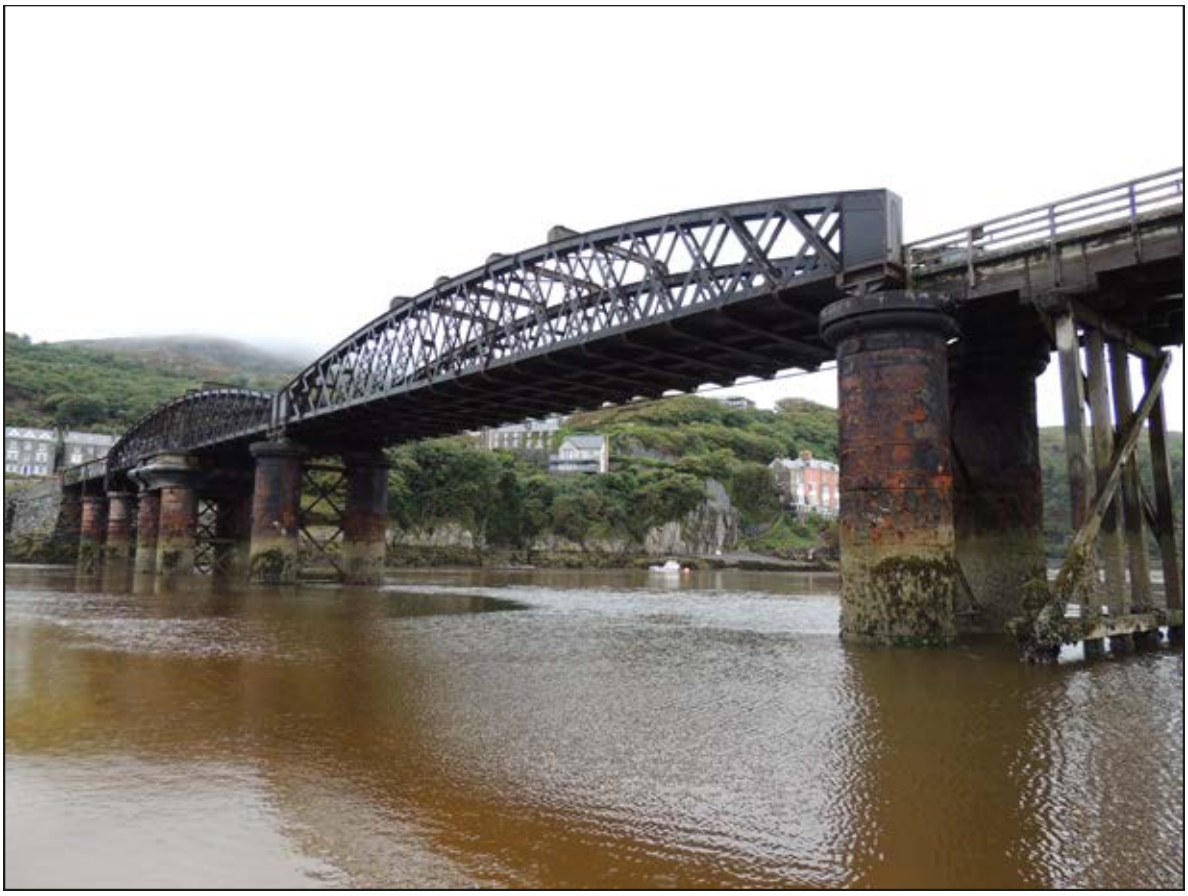

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Archaeology Wales

Written Scheme of Investigation

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E: info@arch-wales.co.uk
www.arch-wales.co.uk

Specification

For Archaeological Desk Based Assessment:

Pont Rheilffordd, Abermaw, Gwynedd

Prepared for:

Ecovigour

Project No: 2762

July 2020

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Contents

NON-TECHNICAL SUMMARY

This Specification details the proposal for an Archaeological Desk Based Assessment associated with proposed refurbishment works on the Grade II listed Pont Rheilffordd (lb 5207), Aberamffra Road, Barmouth, Gwynedd, LL42 1TB (NGR SH 619 154).*

This Written Scheme of Investigations has been prepared by Archaeology Wales Ltd for Ecovigour.

1. Introduction

1.1. The proposed development is associated with refurbishment works (timber sections) of the Grade II* listed Pont Rheilffordd (lb 5207), Aberamffra Road, Barmouth, Gwynedd, LL42 1TB (NGR SH 619 154) (Figure 1). The local planning authority is Gwynedd Council.

1.2. This WSI has been prepared by Irene Garcia Rovira, Project Manager, Archaeology Wales Ltd (henceforth - AW) at the request of Ecovigour. It provides information on the methodology that will be employed by AW during a Desk Based Assessment and Site Visit. The methodology set out in this WSI has been agreed with GAPS in its capacity as archaeological advisors to the local planning authority.

1.3. All work will conform to the *Standard and Guidance for Historic Environment Desk Based Assessment* (CIfA 2017) and be undertaken by suitably qualified staff to the highest professional standards. AW is a Registered Organisation with the CIfA.

2. Site Description and Development Details

2.1. The proposed development aims to refurbish the timber sections of the Grade II* listed Pont Rheilffordd (lb 5207), Aberamffra Road, Barmouth, Gwynedd, LL42 1TB (NGR SH 619 154) (Figure 1).

2.2. The bridge was designed by Benjamin Piercy and was opened in 1867. Rebuilding works are known to have occurred at the bridge between 1899 and 1909 and in the period between 1981 and 1985. The bridge crosses the estuary of the river Mawddach.

2.3. The latter is defined as a sandy estuary adjacent to Barmouth and 12km from

Dolgellau. The estuary was a centre of ship building and gold panning during the 18th century. Intertidal deposits with archaeological potential are known to exist in the vicinities (e.g. Friog Corner, Fairbourne – see Philp 2018).

2.4. The proposed designs also include the construction of an access track which connects the bridge to the A493.

2.5. The underlying geology is defined the Vigra Member and the Ffestiniog Flags Formation (compound area) – mudstone, siltstone and sandstone – formed during the Cambrian Period. The superficial deposits are characterised as Tidal Flat Deposits of clay, silt and sand formed during the Quaternary Period (BGS 2020).

3. Site specific objectives

3.1. The primary objective of the Desk Based Assessment will be to assess the potential impact of the development proposals on the historic environment by means of a detailed desk-based study and site visit. This will help inform future decision making, design solutions and potential mitigation strategies. The aim will be to make full and effective use of existing information in establishing the archaeological significance of the site, to elucidate the presence or absence of archaeological material, its character, distribution, extent, condition and relative significance.

3.2. The work will include a comprehensive assessment of regional context within which the archaeological evidence rests and will aim to highlight any relevant research issues within national and regional research frameworks.

3.3. The proposed archaeological work will attempt to elucidate the presence or absence of archaeological material that might be affected by the development, in particular its character, distribution, extent and relative significance. The Desk Based Assessment will collate all available historic environment information and cartographic evidence pertaining to the bridge history and development.

3.4. This Desk Based Assessment will result in a report that will provide information of sufficient detail to allow informed planning decisions to be made which can safeguard the archaeological resource. The information could then be used to determine further archaeological investigation or appropriate mitigation strategies for any archaeological remains within the area to be implemented prior to or during the proposed development. Preservation *in situ* will be advocated where at all possible, but where engineering or other factors result in loss of archaeological deposits, preservation by record will be recommended.

4. The proposed archaeological work

4.1. The aim of the Desk Base Assessment is to establish and make available information about the archaeological resource existing on the site. The work will include the following elements:

- A detailed Desk Based Assessment (Stage 1)
- A site visit (Stage 2)
- The production of an illustrated report and the deposition of the site archive (Stage 3)

5. Method statement for a detailed desk-based assessment (Stage 1)

5.1 The assessment will consider the following:

a) The nature, extent and degree of survival of archaeological sites, structures, deposits and landscapes within the study area. It will involve the following areas of research:

1. Collation and assessment of all relevant information held in the regional HER, within a 1km radius from the centre of the proposed development area (Figure 2).
2. Collation and basic assessment of the impact on all Designated archaeological sites (Scheduled Ancient Monuments, Listed Buildings, Historic Parks & Gardens, landscapes, Conservation Areas) within 1km from the centre of the proposed development area (Figure 2).
3. Assessment of all available excavation report and archives including unpublished and unprocessed material affecting the site and its setting.
4. Assessment of all extant aerial photographic (AP) evidence. This will include visits to Central Register of Air Photography for Wales, in Cardiff, CUCAP and Welsh Government Historic Aerial Photography WMTS.
5. Assessment of archive records held at the County Archives, Bangor University and as appropriate, site files held by RCAHMW.
6. Records held by the developer e.g. bore logs, geological/geomorphological information, aerial photographs, maps, plans.

7. Examination of other known coastal deposits of archaeological interest situated along the Welsh coastline, particularly in the vicinities of the development.
8. Map regression analysis using all relevant cartographic sources e.g. All editions of the Ordnance Survey County Series, Tithe and early estate maps (as available).
9. Place name evidence.
10. Internet sourced satellite imagery and LiDAR imagery as available.
11. Assessment of the records held at the Portable Antiquities Scheme.
12. Historic documents (e.g. Charters, registers, estate papers).

b) The significance of any remains in their context both regionally and nationally and in light of the findings of the desk-based study.

c) The history of the site based on the areas of research outlined above.

d) The potential impact of any proposed development on the setting of known sites of archaeological importance (this will constitute a brief assessment, rather than a formal assessment such as that detailed in the Design Manual of Roads and Bridges). This will adhere to the setting assessment guidance (Stages 1-4) outlined in Cadw's Setting of Historic Assets in Wales (2017).

e) The potential for further archaeological remains to be present, which have not been identified in pre-existing archaeological records.

f) The potential for further work, with recommendations if requested and where appropriate for a suitable investigative and/or mitigation methodology.

6. Method statement for a Site Visit (Stage 2)

6.1. The site visit will focus on the examination of the character, phasing and preservation of the listed bridge (lb 5207). Furthermore, it will focus on a visual walked search of the development area. The ground surface will be visually inspected for all earthworks, structures and finds (access track and compounds). The location of any environmental archaeological deposits, or areas which may have a potential for such deposits, will also be considered along with the visible archaeology. Observations

concerning possible visual impacts of the development over other designated assets will also be carried out.

6.2. All located sites or finds will be accurately fixed by means of GPS. Each individual find or site location will have an accurate NGR reference attached. Where a close cluster of related features is identified a single NGR for the centre of the cluster will be used, and each constituent feature separately described in the text.

6.3. The character, function, condition, vulnerability, potential dating and relationship to other features of each identified site or find will be described fully. The importance of the site or find will be assessed in terms of local, regional or national significance.

6.4. A sketch survey of each identified site layout will be made with accompanying metric measurements.

6.5. Written, drawn and photographic records of an appropriate level of detail will be maintained throughout the course of the project. Digital photographs, including metric scales, will be taken using cameras with resolutions of 10 mega pixels or above.

6.6. Illustrations will be drawn to a scale of 1:50, 1:20 and 1:10 as required, and these will be related to Ordnance Survey datum and published boundaries where appropriate.

6.7. The site visit will also assess the visual impact of the proposed development on the setting of known sites of archaeological importance. Photographs will be taken from the proposed development to help illustrate and assess this visual impact and Designated sites within the study area will also be visited, where possible, with photographs taken towards the proposed development to help illustrate and assess this visual impact on these sites.

7. Method statement for the production of an illustrated report and the deposition of the site archive (Stage 3)

7.1. A report will be produced which synthesises the results of stages 1, 2 and 3 and thereby assesses the total archaeological resource within the development area.

7.2. The results will be presented in a report and will be detailed and laid out in such a way

that data and supporting text are readily cross-referenced. The HER Officer will be contacted to ensure that any sites or monuments not previously recorded in the HER are given a Primary Record Number (PRN) and that data structure is compatible with the HER. The historical development of the site will be presented in phased maps and plans comprising clearly, the outline of the site.

7.3. Within the report an attempt will be made to indicate areas of greater or lesser archaeological significance and the sites will be ranked in level of overall archaeological importance (locally, regionally and nationally).

7.4. All relevant aerial photographs, re-plots and historic maps will be included and be fully referenced. Any site photographs included in the report will be appropriately captioned and clearly located on a suitably scaled site plan.

7.5. The report will include the following sections:

- Bilingual non-technical summary
- Introduction (including design brief and planning background)
- Aims and Objectives
- Methodology
- Site topography and geology
- Archaeological and Historic background (period based)
- Cartographic resources
- Aerial Photographs/ remote sensing resources
- Walkover survey
- Assessment of Archaeological Potential (including impacts upon archaeological potential)
- Development Impacts: Physical Impacts
- Development Impacts: Settings Impacts
- Conclusions/ recommendations for mitigation
- Supporting illustrations at appropriate scales
- Supporting data, tabulated or in appendices
- References and Bibliography

7.6. The report will also include the following:

1. a copy of the design brief (if applicable)
2. a location plan
3. all identified sites plotted on an appropriately scaled plan of the proposal site
4. a gazetteer of all located sites with descriptive detail including grid reference and

period where possible

7.7. Copies of the report will be sent to the client and to GAT following GAPS approval, and for inclusion in the HER. Digital copies will be provided in pdf format. The project will adhere to the Welsh Archaeological Trust's joint Guidance for the Submission of Data to the Welsh Historic Environment Records (2018).

The site archive

7.8. A project archive will be prepared in accordance with the National Monuments Record (Wales) agreed structure and be deposited with the National Monuments Records, held and maintained by the RCAHMW, Aberystwyth, on completion of site analysis and report production. It will also conform to the guidelines set out in *The National Standard and Guidance to Best Practice for Collecting and Depositing Archaeological Archives in Wales 2017* (National Panel for Archaeological Archives in Wales 2017). The digital archive will be deposited with the NMR.

7.9. Although there may be a period during which client confidentiality will need to be maintained, the report and the archive will be deposited not later than six months after completion of the work.

7.10. Other significant digital data generated by the survey (ie AP plots, EDM surveys, CAD drawings, GIS maps, etc) will be presented as part of the report on a CD/DVD. The format of this presented data will be agreed with the curator in advance of its preparation.

8. Resources and timetable

8.1 Standards

The Desk Based Assessment will be undertaken by AW staff using current best practice.

All work will be undertaken to the standards and guidelines of the CIfA.

8.2 Staff

The project will be undertaken by suitably qualified AW staff. Overall management of the project will be undertaken by Irene Garcia Rovira MCIfA.

8.3 Timetable of archaeological works

The work will be undertaken at the convenience of the client and is likely to commence imminently.

8.4 Insurance

AW is fully insured for this type of work, and holds Insurance with Aviva Insurance Ltd and Hiscox Insurance Company Limited through Towergate Insurance. Full details of these and other relevant policies can be supplied on request.

8.5 Arbitration

Disputes or differences arising in relation to this work shall be referred for a decision in accordance with the Rules of the Chartered Institute of Arbitrators' *Arbitration Scheme for the Institute for Archaeologists* applying at the date of the agreement.

8.6 Health and safety

All members of staff will adhere to the requirements of the *Health & Safety at Work Act*, 1974, and the Health and Safety Policy Statement of AW.

9. References

Cadw, 2017. Setting of Historic Assets in Wales

Chartered Institute for Archaeologists, 2014. Standards and guidance for the collection, compilation, transfer and deposition of archaeological archives.

Chartered Institute for Archaeologists, 2014. Standards and guidance for the collection, documentation, conservation and research of archaeological materials.

Chartered Institute for Archaeologists, 2014. Standards and guidance for historic environment desk-based assessment.

Philp R. 2018. A Palaeoenvironmental Investigation at Friog Corner, Fairbourne, Dollgellau Interim Report: Phases 1 and 2 Palaeoenvironmental survey, sampling and radiocarbon dating. AW Report 1682.

Welsh Archaeological Trusts, 2018. Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs).

British Geological Survey: Geology of Britain viewer: www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html

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