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LLYN DULYN HYDRO ELECTRIC SCHEME

ARCHAEOLOGICAL RECORDING & WATCHING BRIEF

REPORT NO. 274 G1476

Ymddiriedolaeth Archaeoloegol Gwynedd

Gwynedd Archaeological Trust

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LLYN DULYN HYDRO ELECTRIC SCHEME ARCHAEOLOGICAL RECORDING & WATCHING BRIEF (G1476) 1.0 INTRODUCTION

National Power have renewed the water pipeline between Llyn Dulyn (SH70226636), and Dulyn weir (SH72416752) as part of their hydro electric power scheme for Dolgarrog Power station. They have also installed a turbine house just north of the weir (SH72386753) with the water then being diverted through the tunnel to Llyn Eigiau to be re-used at Dolgarrog. The work was carried out from the beginning of June 1997 until the end of August 1997 by the contractors, Mulcair.

An archaeological assessment of the scheme by Gwynedd Archaeological Trust in November 1994 recommended mitigation measures, particularly where the pipeline runs through a scheduled ancient monument, Pant y Griafolen huts and enclosures (SH70806660). The archaeological aims were to carry out a watching brief over the entire length of the pipeline, so that any archaeological sites uncovered could be recorded *in situ*. Specific conditions set out in Section 2 of the Ancient Monuments and Archaeological Areas Act of 1979 were provided by Cadw and had to be met where the pipeline passed through the scheduled area. Ancient Monument Consent to the proposed works at Pant y Griafolen Huts and Enclosures, granted on the 2nd April 1996, was dependent on the following conditions :

- 1. Access to the site shall be afforded to representatives of Cadw
- 2. All digging within the scheduled area shall be undertaken by hand
- A watching brief of the excavation of the trench within the scheduled area shall be undertaken by a professional archaeologist on behalf of the Secretary of State
- 4. Any excavation of the trench which is necessary beyond its present width, shall be supervised by the appointed archaeologist, who shall fully record any features of archaeological interest revealed during the course of the work
- The spoil created by digging the trench within the scheduled area, shall be placed on a sheet to keep it separate from the existing ground material and carefully replaced
- Following the backfilling of the trench, any surplus spoil shall be disposed of outside the scheduled area
- In exceptional circumstances light machinery shall be used within the scheduled area of the monument provided that :
 - · the work cannot be accomplished by hand
 - the work is archaeologically supervised
 - archaeological advice is taken about the most suitable route for the machinery within the scheduled area

- suitable measures are taken to protect any archaeological features from disturbance by the wheels or tracks of the machinery
- 8,
- The turf shall be saved and replaced on completion of the work and encouraged to develop
- 9. A brief report of the work undertaken and any archaeological features uncovered shall be deposited with Cadw and with the National Monuments Record for Wales at the Royal Commission on the Ancient and Historic Monuments of Wales in Aberystwyth within three months of the date of completion of the works

2.0 ARCHAEOLOGICAL & HISTORICAL BACKGROUND

The initial archaeological assessment prior to topsoil stripping identified ten archaeological sites of which only two were directly affected by the renewal of the pipe. These were the Pant y Griafolen settlement and the original pipeline. Two other sites of minor significance were affected by the easement corridor. These were the sheepfold at SH71266712 and a bank at SH71306715 both situated alongside the Ffrwd Cerriguniaun.

2.1 Pant y Griafolen Settlement

The Prehistoric settlement of Pant y Griafolen is situated on the northern side of the Afon Dulyn valley, about 800m east of Llyn Dulyn and at an average height of 503m above sea level. It is the only settlement found in north west Wales at over 500m above sea level (Griffiths 1950, 55). The site extends to approximately 4 acres and consists of approximately 28 huts, ranging from 2.5m to 4.3m diameter, with 5 cairns of 2.5m to 6m diameter and numerous irregular enclosures (RCAHMW, 1964).

Some of the enclosures have been cleared of stone and were probably cultivated while others remain uncleared and could have been used for livestock. The majority of the enclosures are small and irregular and divided by rough walls of piled stone up to 3.5m wide, usually from clearance of the plots themselves. Some enclosures are strongly lynchetted while others take advantage of natural terraces. The settlement contains two circular 'pounds' of 33.5m and 19.2m diameter. The larger, to the south east of the pipeline, surrounds a stand of pine and contains a later ruin and an indeterminate number of huts. The smaller enclosure, adjacent to the southern side of the pipeline, is lynchetted and contains two huts on opposite sides of the enclosing wall. These uncommon circular 'pounds' are restricted to the largest settlements in North Wales (Griffiths 1950, 56).

Many of the huts occur in groups of two or three with adjoining walls forming semicircular enclosures. Each group of huts and fields is separated from its neighbour by a stretch of uncleared ground (Griffiths 1950, 55). The huts are mainly round, although some are oval in shape, with a single course of laid local stone, some with slabs set on edge. Where visible, the entrances tend to be on the east, away from the prevailing south westerly wind. Several of the huts have been rebuilt by later shepherds as shelters, particularly on the flatter ground to the south of both the circular 'pounds'. The huts have been classified by the Royal Commission as IIa, upland type of hut associated with enclosures (RCAHMW 1964). Conclusive dating evidence has proved elusive but the settlement is most likely to be of Iron Age date (c.500-100 BC) or possibly of Bronze Age date (c. 2000-1500 BC).

A plan of the archaeological features within the working area for the pipeline is shown in Drawing No 1476/01. It shows 17 huts and 4 cairns none of which are on the line of the pipe and only a few are close to the easement. Definite walls are shown and the line of possible walls are noted. In referring to specific huts or cairns in this document the numbers or letters used in this plan have been used.

2.2 The Original Pipeline

The original pipeline was excavated at the end of the nineteenth century and is briefly described in 'Dolgarrog: An Industrial History' (Jones & Gwyn, 1989). The closing decades of the nineteenth century brought about fundamental changes in the pattern of land ownership and land use in this part of north Wales. These included a decline in livestock farming leading to wealthy landowners selling off outlying portions of their estates, a growth of coastal towns requiring new domestic water supplies and developments in the technology of water-generated electricity. Llandudno Improvement Commissioners, who became the Urban District Council in 1894, were one of the first to exploit the natural resources of the area for Llandudno's water supply by damming Llyn Dulyn.

The preliminary work began on the dam at Llyn Dulyn in April 1878 and the scheme was completed in 1881. The trench for the pipe was hand dug by Irish navvies and a 14 inch diameter salt-glazed earthenware pipe, made by Doulton & Co, was laid. A tunnel was excavated from Llyn Dulyn to a point about 25m below the lake where valves were installed to control the flow of water. Due to the remoteness of the site, materials for the scheme were hauled by 100 specially built sledges from depots at Tan y Gaer, above Llanbedr village, and at Bwlch y Gaer, 5 km below the lake.

In 1904 the entire Dolgarrog estate was sold to the Aluminium Corporation Ltd who commenced work on a power station and furnace room at Dolgarrog in 1907. A dam was constructed at Llyn Eigiau and a high pressure pipeline was installed. The tunnel from the weir on Afon Dulyn to Llyn Eigiau was started in 1914 and completed in 1916, by which time materials could be brought up by horse and cart. Some very narrow guage rails were laid inside the tunnel to transport materials during construction.

2.3 Sheepfold

This small sheepfold, situated on the eastern bank of the Ffrwd Cerriguniaun, is in a reasonable state of repair. It consists of a double irregular shaped pen of dry stone walls.

2.4 Bank

To the east of the above sheepfold are the remains of a low bank, approximately 30m

in length and 0.3m high.

2.5 Other Sites

Six other sites were identified in the archaeological assessment with two of regional importance. These were a long house with enclosure at SH70836686 and a round hut with enclosure at SH71716739. The cottage at SH70526640 was considered of local importance. The other sites, of minor significance, listed in the archaeological assessment were a sheepfold at SH72266767, the dam at SH72426755 and some hut circles which had been identified from aerial photographs but were not located during the field survey None of these were within, or close to, the easement and none were subsequently affected by the work.

3.0. GEOLOGICAL BACKGROUND

The underlying rock in this area is mainly sandstone of the Cwm Eigiau Formation with acid ash-flow tuffs of the Capel Curig Volcanic Formation on the east side of Llyn Dulyn and a thin band of acid ash-flow tuffs of the Lower Crafnant Volcanic Formation between Afon Carreg-wen and Afon Ddu (Roberts, 1979). The cliffs on the west side of Llyn Dulyn consist of spilitic dolerite, a very iron-rich altered rock, contributing to the iron-rich soils in the valley (Ball, 1963).

4.0 METHODOLOGY

4.1 General

The route of the pipeline was examined during and following the initial fencing of the 7m wide easement and topsoil stripping between 4th and 18th June. The 6m long steel pipes with cement linings were dropped by helicopter just outside the easement during the week ending 3rd July.

The route was examined at intervals during the course of excavation and back filling between 8th July and 15th August 1997. Excavation of the trench for the new pipe began on 8th July using two gangs, starting at different locations, with an excavator to dig the trench and another to backfill. This meant that only a short length of trench was exposed at a time. A plastic ducting was laid next to the steel pipe to carry electric cables to monitor lake levels and water pressure. Part of the trench was left open every 230m for these cables to be joined. The trench was also left open where angle pieces of steel were inserted to change the direction or level of the new pipe. These had to be supported using concrete, which was dropped by helicopter to the specific sites on 31st July.

A building to house the turbine was constructed of stone-clad breeze blocks under a slate roof at SH72386753. A trench was dug to west side of the building to carry the water pipe, as shown in Plate 1, and another to the north side to carry the electric cables. These trenches were monitored on the 8th and 11th August.

Work on the western end of the pipeline, from the scheduled area to Llyn Dulyn, was monitored from 23rd July until 15th August. The excavators involved in this work had to be taken over the hill to the north of the scheduled area to avoid the sensitive area between the settlement and Afon Dulyn. The new pipe was joined to the existing valves below Llyn Dulyn. One of these valves is illustrated in Plate 2.

The topsoil was reinstated using machines mostly during the back filling process. Some turves were replaced and compacted by hand.

4.2 Scheduled Area

The pipeline did not pass through any of the huts or cairns within the scheduled area although it was very close to Huts 8, 11, 12 and 17 (Plate 3) and two cairns, B and C. It crossed six of the enclosure boundaries and the northern tip of the smaller circular 'pound'. The boundaries were marked on the north and south sides of the working corridor with coloured ribbon to identify them as requiring special care by the contractors.

The easement through the scheduled ancient monument was not fenced but was monitored during the topsoil stripping process between 16th and 18th June. This was carried out using a 4.5 ton excavator with the soil and turves being stored on terram sheeting laid out on the grass to the north of the easement.

Plastic piping was used in the scheduled area as its installation was considered to be less damaging than the heavier steel pipes. The 12m long and 630 mm diameter plastic pipes were dropped by helicopter, mainly in the working corridor, during the week ending 3rd July and the welding of these pipes was monitored between 8th and 15th July. The pipes were too heavy to lift by hand and needed the 4.5 ton excavator to lift and locate them in the welding frame. The end of both pipes were then shaved and welded together using a plate heated by a generator. The welding frame was operated by hydraulic equipment also using the generator. On completion of a joint all this equipment had to be moved, mainly by machine, 12m along the easement to the next joint. This operation involved a lot of manoeuvring by the excavator with potential for damage to the archaeology. Some stones had to be moved to enable the machine to pass. These were photographed whenever possible and relocated during reinstatement. The majority of such stones had drill holes in them and had obviously been moved during the previous pipeline construction.

The welded pipe, shown in Plate 4, then had to be moved out of the easement to enable the 4.5 ton excavator to dig the trench. It was decided to move the pipe to the south side of the easement as the spoil had to be stored on the north side. The excavator could not lift the welded pipe so it had to be moved using a turfer, crow bars and wedges of timber. This operation, which was monitored between 18th and 23rd July, was also potentially damaging to the archaeology and although some stones were slightly dislodged and others were loosened, great care was taken to minimise the damage.

The digging of the trench for the new pipe and its insertion were monitored from 23rd to 30th July. Initially two 4.5 ton excavators were used to dig the trench working outwards from the centre of the settlement but shortly after the commencement of this operation a large boulder was encountered towards the east end and one machine had to be fitted with a pecker to break up the rock. It was then found that it was better to

work from the east end of the settlement, digging the trench by machine, as shown in Plate 5, and inserting the pipe simultaneously by hand using the turfer, block and tackle, crow bars and timber wedges. It proved impossible to lift the pipe over a particularly pointed rock near the middle of the settlement. The stone had a drill hole in it showing that it had been moved previously so, in order to avoid damage elsewhere, it was decided to knock the point off with a sledge hammer. The spoil from the trench was stored on terram sheets to the north of the easement. Some of it had to be stored on top of the enclosure boundaries as the top soil had been stored in the most suitable places. Inevitably some spoil went over the sides of the terram and proved very difficult to retrieve from between the rocks.

Back filling was monitored from 29th July to 6th August. Unfortunately it proved impossible to get a toothless bucket to the site for the excavator so only the top layer of fill could be moved using the machine with the rest being moved by hand using spades to clear the terram. This tended to tear the terram often dropping spoil onto the rocks below where it was difficult to clear. Most of the stones excavated during the digging of the trench were re-buried together with most of the broken ceramic pipe and some of the plastic shavings and terram sheeting. A plastic ducting was laid next to the new pipe to carry an electric cable to monitor lake levels and pressures. Openings were left every 230m allowing access to the ducting for the electricians to install the cable. These were later filled by hand.

Reinstatement of the topsoil took place from 7th to 11th August. This was undertaken using the 4.5 ton excavator to move the bulk of material with the rest being moved by hand using spades, rakes and brooms. The operation was begun at the west end of the scheduled area so that the machine could work to the east end without having to go back through the settlement. There was a lack of turves in places particularly where the back filling material had been mixed with the top soil. Rocks, with their lichen covered sides exposed, were randomly replaced along the line of the pipe to look as natural as possible. A few previously buried rocks, which could not be disposed of elsewhere, were also incorporated in the surface. Where photographs had been taken, specific large rocks could be relocated with greater accuracy.

5.0 RESULTS

5.1 General

The topsoil stripping phase did not reveal any archaeological features that had not been noted previously either within the scheduled area or elsewhere along the pipeline.

The trench had an average width of 1.5m but varied in depth from 1.5m - 4m depending on the undulations of the terrain. The excavation of the pipe trench closely followed the line of the nineteenth century pipe. This was identified by the exposure of the 14 inch diameter salt-glazed ceramic pipe in 1.2m lengths, made by Doulton & Co. Concrete markers identified brick-lined inspection chambers with iron manhole covers and raised air vents, shown in Plate 6, which occurred at regular intervals along the course of the pipeline.

The soil profile within the excavated trench showed the recent disturbance caused by the laying of the nineteenth century pipe, along most of its length. In a few places the trench was wider or deeper than its predecessor allowing an opportunity to assess the character of the underlying local geology. The principal soil profile consisted of 3-5 cm of very dark grey highly humus loam overlying a reddish brown sandy loam varying in thickness from a few centimetres to two meters. This iron-rich soil was particularly deep between Afon Carreg-wen and Afon Ddu where the vegetation was predominantly grass species. In some places the red-brown soil had a thin covering of peat. The lowest strata visible consisted of a moderately stony grey boulder clay overlying the solid rock. Along most of the pipeline the grey clay was overlain by varying thickness of dark brown peat. Very thick layers of peat, up to 4-5m, were encountered just to the west of Ffrwd Cerriguniaun and to the north of the Pant y Griafolen settlement where the pipeline made a right angled turn to the south. The vegetation in these areas consisted of moss, sedges and reeds. The deep peat proved very difficult for the machinery as the 25 ton CAT excavator tended to sink up to the cab, even on bog mats, and the 7m easement proved too narrow to work from the side of the trench. The narrowness of the easement also caused problems with containing the spoil from the excavation.

During the course of the watching brief further features were located outside the easement. A previously unrecorded single round hut within a terraced enclosure was found at SH71306708. This consisted of a round hut of c. 6m diameter with a possible entrance to the east situated on a natural terrace on the north eastern bank of the stream Ffrwd Cerriguniaun. The hut is located on the western side of a boulder lined cleared enclosure with a natural boulder spread forming the north western boundary. Another wall extends to the north west of the hut.

Another single round hut was found on the eastern bank of Ffrwd Cerriguniaun at SII71416701 near the confluence with Afon Dulyn. This hut, c.6m diameter, is also located on a natural terrace above the river with a possible entrance on the eastern side.

A standing stone way marker was found at SH71316715 less than 3m to the south of the easement corridor. The stone is a rough local boulder 1.2m long set on end at the edge of the footpath marked on the OS map.

5.2 Scheduled Area

The plastic pipe used in the scheduled area did not need as much depth of cover as the steel pipe used elsewhere. The trench for the new pipe through the Pant y Griafolen Settlement was, therefore, on average 1m deep and 1.2m wide.

Where the new trench was along exactly the same line as the nineteenth century pipeline the soil profile consisted predominantly of a brown/grey redeposited soil overlying the stony grey boulder clay. At the eastern end of the scheduled area the new trench was located slightly to the north of the old one and showed a different profile on the northern side of the trench. Below the dark brown turf layer was a 0.3m depth of fine red/brown silty sand overlying 0.15m of light brown silty sand which in turn was overlying a 0.45m depth of a grey/brown clay with frequent small stones.

Twenty metres to the west of Hut 17 the north side of the trench again extended beyond the limit of the old trench and revealed a similar profile. Here a band of very dark brown small stones between the red/brown silty sand and the grey/brown clay, showed iron leaching from the red sandy soil above, but was not archaeologically significant.

Particular notice was taken where the field boundaries crossed the line of the new pipeline. It was found that, as elsewhere, these had been disturbed by the excavation of the previous pipeline. The trench was a little wider to the south on the boundary line to the north east of Hut 11 where it was revealed that the visible boulders were resting on the natural ground surface.

Just outside the western end of the scheduled area the original pipe passed through a boulder field where it was not possible to excavate. Consequently a retaining wall had been constructed to the south of the line of the pipe allowing soil to be brought in to surround the ceramic pipe. This wall extended for 8m, was 0.75m high and 0.4m wide. It consisted of local, mainly long and flat, stones and was faced on the north side facing the trench. This wall was exposed briefly during excavation and remains *in situ* below the present ground level.

6.0 SUMMARY

The watching brief carried out between 4th June and 15th August on the excavation of the main pipeline did not reveal any significant archaeological features. It enabled examination of the construction of, and artefacts belonging to, the nineteenth century pipeline. Two sections of the ceramic pipe were removed for future reference. Several lengths of ceramic pipe and a few of the brick built inspection chambers were left *in situ* beside the new pipe.

Two hut circles and associated enclosures were found close to the pipeline, during the watching brief, highlighting the further archaeological potential of the area. A way marker close to the pipeline was undamaged during the construction work.

No new information was gained from the watching brief within the Pant y Griafolen scheduled area but in accordance with the conditions of the Scheduled Monument Consent issued by CADW the work was carefully monitored and mitigation measures taken to protect the site from potential damage during the construction process.

BIBLIOGRAPHY

Ball D F, 1963 - The Soils and Land Use of the District Around Bangor and Beaumaris - HMSO

British Geological Survey, 1993 - Bangor Sheet 106 : solid Edition - 1:50000 Series -Natural Environment Research Council

Griffiths W E, 1950 - Early Settlements in Caernarvonshire - Archaeologia Cambrensis Vol CI Part 1 - Cambrian Archaeological Association p 38-71

Jones E & Gwyn D, 1989 - Dolgarrog : An industrial history - Gwynedd Archives

Museums Service p 25-34

Lowe W Bezant, 1912 - The Heart of Northern Wales - Private Publication p 105-106

OS Map, 1991 - Snowdon - 1:50000 Landranger Series Sheet 115

RCAHMW, 1956 - Caernarvonshire - Volume I: East - RCAHMW p 27-28

RCAHMW, 1964 - Caernarvonshire - Volume III : West - RCAHMW p lxxxvii-cvii

Roberts B, 1979 - Geology of Snowdonia & Llyn - Adam Hilger Ltd





Plate 1 - Water pipe entering turbine house



Plate 2 - Valve below Llyn Dulyn



Plate 3 - Hut 17 to south of pipeline



Plate 4 - Welded pipe within easement



Plate 5 - Trench within scheduled area



Plate 6 - Inspection chamber of old pipeline

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