Garnfadryn Pumping Station Water Renewal

Archaeological Watching Brief

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Garnfadryn Pumping Station Water Renewal

Archaeological Watching Brief

Project No. G2290

Report No. 1104

Prepared for: Dwr Cymru

January 2013

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SUMMARY

Gwynedd Archaeological Trust (GAT) conducted an intensive watching brief during the ground work for the replacement of the water main at Garnfadryn Pumping Station, Llyn Peninsula, Gwynedd (centred on NGR SH27783446). The route of the mains renewal programme ran from the reservoir located south of Carn Fadryn, in a southerly direction through farmland and across a local road, continuing south-southwest through fields to the pumping station, a distance of approximately 460.0 metres. A total of eight LR Pits *were excavated for pipe bursting, and two sections of open cut trench were excavated to lay the new pipe directly into the ground. The watching brief took place between the 12th November 2012 and 4th December 2012.*

The LR pits were excavated to locate the 1960's main, in ground which had previously been disturbed. In order to locate the original main at LR pits 7 and 8, an L-shaped pit and an irregularly shaped pit respectively were excavated. The 1960's main was deeper at this point in order to pass under the drainage ditch separating fields 6 and 7, and the exact location of the main in both pits was determined by opening a narrow trench in an east/west direction until the main was observed, after which the pit was excavated over the length of the main in a north/south direction to enable pipe bursting. Fields 6 and 7 were extremely wet and the ground was waterlogged in both.

*The route of the water main renewal was situated to the south and west of several prehistoric archaeological features, and to the northwest of the Llaniestyn Medieval Township (**PRN: 6,566**).*

1.0 INTRODUCTION

Gwynedd Archaeological Trust was commissioned by *Dŵr Cymru* to carry out an intensive archaeological watching brief during the groundwork of the water main renewal (WMR) at Garnfadryn Pumping Station, Llŷn Peninsula, Gwynedd (centred on NGR **SH27783446**) as located on *Dŵr Cymru* Drawing No. **NP2900364-107** (reproduced as Figure 02).

The groundworks were completed by *Mulcair Ltd.* on behalf of *Dŵr Cymru* between 12th November 2012 and the 4th December 2012.

The scheme consisted of the replacement of approximately 460.0m of existing water main and ran southwards from a covered reservoir, through three fields, across a local road to continue south-southwest across three more fields before diverting west to a second covered reservoir. A total of eight LR Pits were excavated for pipe bursting, and two sections of open cut trench were excavated to lay the new pipe directly into the ground. A defunct telecommunication cable followed the route of the original main, and was observed in LR pits 3, 4, 5, 6 and 7.

1.1 Mitigation Requirements

A mitigation brief was not prepared by The Gwynedd Archaeological Planning Services (GAPS) for this work, however an intensive watching brief was recommended (email correspondence: 12th January 2012) due to the proximity of known prehistoric archaeology to the north and east of the project, and the Medieval Township to the southwest (cf. para. 2.0). In response to the GAPS requirements, GAT produced a project design outlining the proposed scheme and archaeological mitigation methodology (see Appendix I for a reproduction of the GAT project design).

Reference was also be made to the guidelines specified in *Standards and Guidance for an Archaeological Watching Brief* (Institute for Archaeologists, 1994, rev. 2001 and 2008)

2.0 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

The route of the WMR passed through an area with known archaeological features dating from the Prehistoric period through to the Medieval period located between c.0.5k and 2k of the scheme. Immediately to the north of the route of the WMR is a prehistoric defensive enclosure, Scheduled Ancient Monument **CN011:** Carn Fadryn Camp (centred on NGR **SH28003520**). A prehistoric unenclosed hut circle settlement is also located *c.*1.2km to the southeast of the scheme (**CN071**: Hut Circle Settlement at Pen-y-Caerau; NGR **SH29003430**). A second prehistoric defensive enclosure, (**CN408:** Carn Saethon; NGR **SH29703370**) is located c.2.4k to the south east. An enclosed hut circle settlement is also located *c.*1.2km to the south-southeast of the scheme (**CN276**: Enclosed Hut Group South of Penbodlas; NGR **SH28603330**).

An examination of the First to Third Edition 25” to 1 Mile Ordnance Survey maps of the area (Caernarvonshire Series Sheet XXXIX.12 1989, 1900, 1919) reveals that the field systems have remained unchanged, while the local road was improved in the twentieth century (Figures 03, 04, 05).

According to *Dŵr Cymru* Drawing No. **NP2900364-107** (reproduced as Figure 02), the existing 3-inch water main was installed in 1960.

3.0 METHODOLOGY

An intensive watching brief was carried out between the 12th November 2012 and the 4th December 2012.

The groundwork for the scheme commenced to the immediate south of Scheduled Ancient Monument **CN011**: Carn Fadryn Camp (centred on NGR **SH28003520**; Figure 01).

The WMR scheme ran for approximately 460m from a covered reservoir at the northern end of the scheme in a southerly direction, through three fields, across a local road and through a further four fields to a covered reservoir at the southern end of the scheme (Figure 02).

The groundwork consisted of excavating 8 launch/reception pits (LR Pits) which were used for pipe bursting along most of the route, and two sections of open cut trenching (OC) where the new pipe was laid directly into the trench (see Figure 02).

The fields were numbered by GAT from 1-7, starting from the northern end of the scheme at the covered reservoir through to the reservoir at the southern end (Figure 02). The LR Pits were numbered 1-8 (Figure 02), and the open cut trenches were labelled A and B (Figure 02). The LR Pits and the trenches were recorded as they were excavated, except LR Pit 4, which was excavated between visits, and was waterlogged when seen, although photographs were taken.

One section of open cut trench (A) was located to the south of the local road, and was necessary in order to make the connection with a valve at the road side and the launch/reception LR Pit located approximately 8m south of the road (Figure 02). The second open cut trench (B) was located at the southern end of the route where pipe bursting was impractical due to the original main turning 45 degrees to the west towards the southern covered reservoir (Figure 02).

A small tracked excavator with a 1m toothless bucket was used to excavate the LR Pits, which were of varying dimensions (see results). A 1m toothless ditching bucket was used to remove the topsoil from the open cut trenches, after which a narrow 0.5m toothless ditching bucket was used to excavate the trench for the new pipe. The topsoil and the subsoil were stored separately beside the LR Pits and the trenches and replaced when the groundwork was completed.

The watching brief consisted of the following:

- Observation of non-archaeological excavation works.
- A written and photographic record of any non- archaeological deposits that were revealed. The camera used was a Nikon D40 digital SLR, set to maximum resolution.
- Preparation of full archive report under project number **G2290**

4.0 TOPOGRAPHY

The groundwork took place in agricultural fields given over to pasture, except field 7, which was poorly drained and mostly waterlogged with reeds and rough grasses. The ground sloped gently to the south over the length of the scheme, though some of the fields at the southern end were fairly flat.

The bedrock geology of the area is Mudstone, which was formed in the Ordovician Period up to 485 million years ago, when the local environment was dominated by shallow seas and deposits of mud, sand, silt, and gravel were laid down.

5.0 RESULTS

5.1 LR Pit 1, Field 1 Plate 1; Figure 02

Size: 1.5m long x 1m wide x 0.8m deep Orientation: N/S

LR Pit 1 was situated 3.5m from the west field boundary and immediately below the northern fence and hedge boundary in ground sloping steeply to the south in order to locate the valve and the original main which were visible at the base of the pit.

The topsoil was mid brown clay silt, with frequent roots, small, medium and large sub-angular stones. Depth = 0.5m

The subsoil was orange brown clay, and the original main was visible in the bottom of the LR Pit. Depth = 0.3m

The natural was not observed.

No archaeological activity was identified within the confines of the LR pit.

5.2 LR Pit 2, Southern reservoir compound Plate 2; Figure 02

Size: 1m long x 1m wide x1m deep Orientation: E/W

LR Pit 2 was excavated to locate the valve situated to the E of the pump house between two manhole covers. The ground had previously been disturbed to install the valve, and pieces of brick and concrete were visible in the spoil and in the pit as it was excavated.

The topsoil was light medium brown clay silt with grit and gravel inclusions. Depth approximately 0.3m

No subsoil was observed in the trench.

The natural was light grey clay with grit and gravel inclusions, this deposit also contained building debris probably associated with the construction of the reservoir. Depth = 0.7m

No archaeological activity was identified within the confines of the LR pit.

5.3 LR Pit 3, Field 2 Plate 3; Figure 02

Size: 3m long x 2m wide x 1.2m deep Orientation: N/S

LR Pit 3 was excavated close to the W boundary at the edge of a bund running N/S around the edge of the field. The LR Pit was 3m south of the bund running E/W across the field.

The topsoil was medium brown clay silt with grit and gravel inclusions and small and medium sub-angular stones. Depth = 0.3m

The subsoil was light brown clay silt with grit and gravel inclusions and small and medium sub-angular stones. Depth 0.3m

The natural was medium orange brown clay. Depth = 0.6m

The 1960’s main was visible at the base of the pit with a telecommunications cable (now defunct). The cable followed the route of the original main.

No archaeological activity was identified within the confines of the LR pit.

5.4 LR Pit 4, Field 3 Plate 4; Figure 02

Size: 4m long x3m wide x 2m deep Orientation: N/S

This LR Pit was situated to the east of the lane to Garnfadryn Hill and north of the local road in the south western corner of the plot. It was in the grounds of Cynefin house which had been renovated recently. The LR pit was located beneath a large spoil heap generated by the building work which had to be removed before the LR pit could be excavated. The deposits were covered by a significant amount of overburden, and appeared to be very disturbed, added to which heavy rainfall meant the whole area was very wet and muddy. The groundwork was completed between visits by the archaeologist and the pit was waterlogged when it was recorded.

The topsoil was dark brown clay silt with small, medium and large sub-angular stones.

The subsoil was light orange clay with small and medium sub-angular stones.

No archaeological activity was identified within the confines of the LR pit, although the depth of the LR pit did not exceed the subsoil horizon.

5.5 LR Pit 5, Field 4 Plate 6; Figure 02

Size: 2m long x 2m wide x1.3m deep Orientation: N/S

LR Pit 5 was situated to the south of the local road, approximately 8m south of the northern boundary. The field sloped gently to the south, levelling off at the southern end. The 1960's main was visible in the bottom of the pit.

The topsoil was medium brown clay silt with small pebbles and occasional small sub-angular stones. Depth = between 0.3m and 0.5m.

The subsoil was orange clay with grit and gravel, small and medium sub-angular stones. Depth = 0.25m.

The natural was pale orange-yellow clay with grit and gravel inclusions. Depth = 0.75m.

No archaeological activity was identified within the confines of the LR pit.

5.6 LR Pit 6 Field 5 Plate 7; Figure 02

Size: 3.4m long x 2.3m wide x1.2m deep

Orientation: N/S

LR Pit 6 was situated at the southern end of the field, approximately 3m to the north of a ditch and bank which formed the field boundary.

The topsoil was medium brown clay silt with small and medium sub-angular stones. Depth = 0.2m

The subsoil was orange clay with small, medium and large sub-angular stones, with occasional boulders. Depth = 0.2m

The natural was light orange brown clay. Depth = 0.9m

No archaeological activity was identified within the confines of the LR pit.

5.7 LR Pit 7 Field 6 Plate 8; Figure 02

Size: 2.2m long x 1.7m wide x 1.5m deep

Orientation: NE/SW

The LR Pit was situated approximately 2m to the north of the southern boundary, which was a ditch and bank, and approximately 10m west of the eastern boundary. A narrow trench (2m x 0.5m wide) was excavated in northeast/southwest direction to locate the original main, and once the main was located, the trench was extended to the north.

The topsoil was light grey brown clay silt with occasional medium sub-angular stones.

Depth = 0.4m

The subsurface deposits were very mixed and the subsoil and natural appeared to have been disturbed, this could be associated with the installation of the 1960's main.

The subsoil was reddish brown clay silt with small sub-angular stones. Depth = 0.3m

The natural was light grey clay with grit, gravel and small sub-angular stones. Depth 0.5m

The 1960's main was visible at the base of the pit. The field was very wet with reeds and rough grasses.

No archaeological activity was identified within the confines of the LR pit.

5.8 LR Pit 8 Field 7 Plate 9; Figure 02

Size: 4m long x 2m wide at the widest point and 1m wide at the narrowest point and1.5m deep

Orientation: NE/SW

LR Pit 8 was excavated to locate the bend in the original main which turned forty five degrees to the west. The LR Pit was situated close to the ditch and bank separating fields 6 and 7, and the bottom of the trench was waterlogged, being 1.5m deep to go under the ditch. The LR Pit was irregularly shaped.

The topsoil was medium brown clay silt with frequent small stones.

No subsoil was observed in the trench.

The natural was pale yellowy grey clay to the west, and medium grey brown possibly re-deposited material to the eastern side of the trench.

No archaeological activity was identified within the confines of the LR pit.

5.9 Open cut trench A, Field 4 Plate 10; Figure 02

Orientation NE/SW

Approximately 10m of open cut trench was excavated from the northern boundary wall in a southerly direction to connect a length of new pipe to a valve at the road and the pipe in LR Pit 5. A service pipe for a domestic supply crossed the trench from the north east in a south westerly direction. The trench was 0.5m wide and 1m deep and was aligned N/S.

The topsoil was light greyish brown with small and medium sub-angular stones.

No subsoil was observed in the trench.

The natural was orange brown clay, and the trench was waterlogged at the bottom.

No archaeological activity was identified within the confines of the trench.

5.10 Open cut trench B, Field 7 Plates 11, 12, 13; Figure 02

Approximately 45m of open cut trench was excavated between LR Pit 8 and LR pit 2 in the southern reservoir compound. The trench measured 0.5m wide and 1.2m deep, and followed a northeast/southwest alignment for approximately 4m from LR pit 8. The trench then curved slightly as it turned to towards the northwest and LR pit 2, where the connection with the valve was made.

The topsoil was medium brown clay silt with frequent small, medium and occasional large sub-angular stones.

No subsoil was observed in the trench.

The natural was medium brown mixed with orange brown clay sand silt with grit and gravel and small and medium sub-angular stones. The bottom of the trench was waterlogged; the field was very wet with reeds and rough grasses.

No archaeological activity was identified within the confines of the trench.

6.0 INTERPRETATION AND CONCLUSION

A total of eight launch/reception LR Pits were excavated by a small tracked excavator using a toothless ditching bucket for pipe bursting. Two sections of open cut trench were excavated; one short section was to connect a length of pipe to a valve at the road which crossed the route of the scheme south of field 3. The longer section was excavated to avoid a bend in the original main which prevented pipe bursting; a length of pipe was laid into OC trench B from LR Pit 8 and was connected to the valve at the southern end of the scheme at the pump house in the compound at the southern reservoir. All the LR Pits were observed and recorded as they were excavated except LR Pit 4, which was recorded later, and the trenches were also observed and recorded.

The LR Pits were small, and were excavated over the original water main, identifying ground which had previously been disturbed, with only a small area of ground to either side of the pipe excavated in new ground, which limited the possibility of finding any archaeology. The open cut trenches were excavated in undisturbed boggy ground, which could have contained archaeological features, however the trenches were quite narrow and OC trench A was very short, with no archaeology observed in either of the trenches.

7.0 SOURCES CONSULTED

Client drawings: *Dŵr Cymru* drawing No.NP2900364-107

Gwynedd Archaeological Trust: Historic Environment Record

Standard and Guidance for Archaeological Watching Brief (Institute For Archaeologists, 1994, rev.2001&2008)

British Geological Survey: www.bgs.ac.uk

Ordnance Survey 1 mile to 25 inch First Edition County Series Caernarvonshire Sheet XXXIX.12 (1889)

Ordnance Survey 1 mile to 25 inch Second Edition County Series Caernarvonshire Sheet XXXIX.12 (1900)

Ordnance Survey 1 mile to 25 inch Third Edition County Series Caernarvonshire Sheet XXXIX.12 (1919)

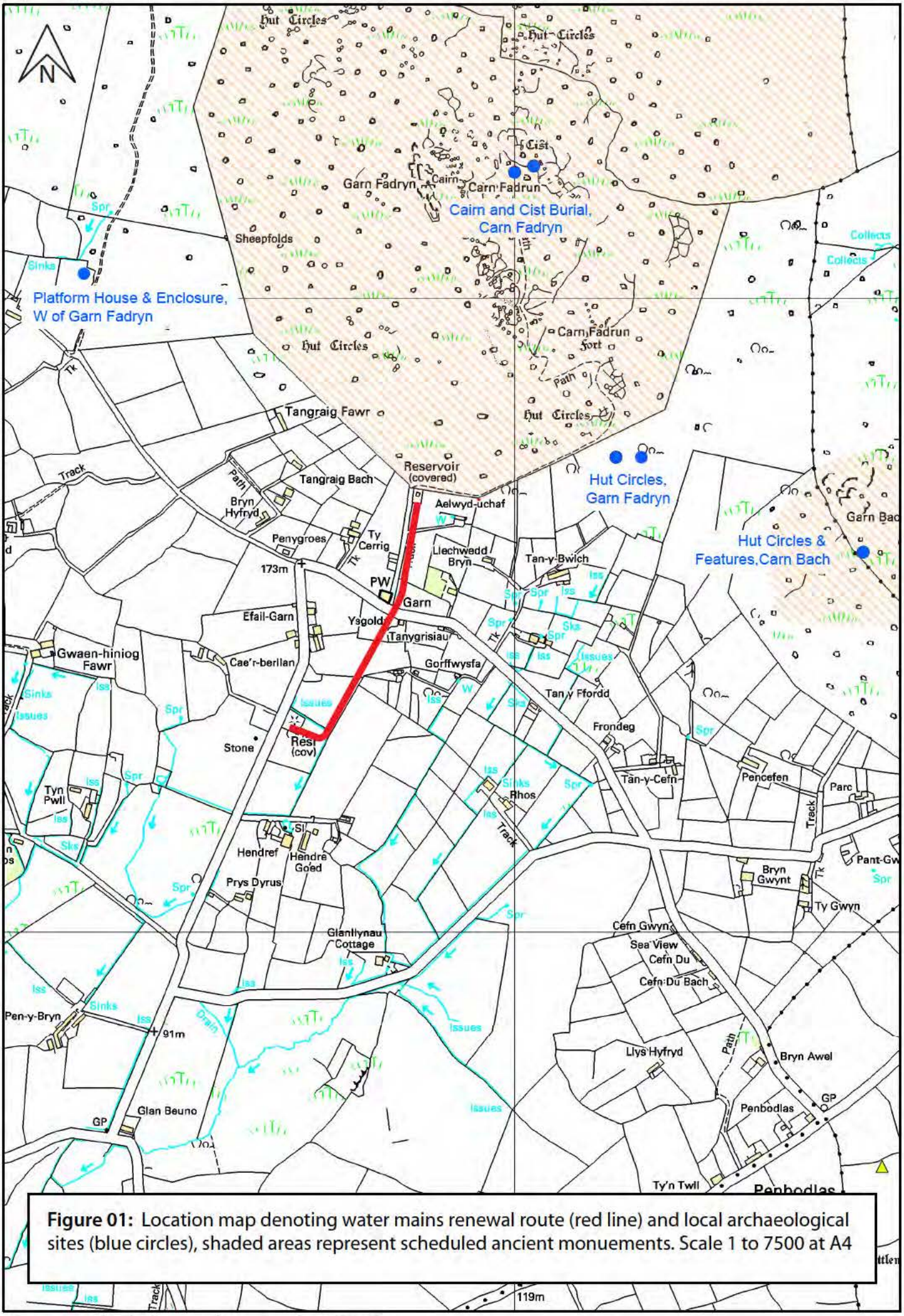

Figure 01: Location map denoting water mains renewal route (red line) and local archaeological sites (blue circles), shaded areas represent scheduled ancient monuements. Scale 1 to 7500 at A4

A1

ALL MEASUREMENTS ARE APPROXIMATE.

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE FOLLOWING DCWW SPECIFICATIONS;
   a. THE CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY REVISION 6 (CESWI 6)
2. DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
4. REPRODUCED FROM THE ORDNANCE SURVEY'S MAPS WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. CROWN COPYRIGHT.
5. THE EXACT LOCATION OF ALL EXISTING APPARATUS IS TO BE DETERMINED ON SITE.
6. LOCATION OF CONNECTIONS TO BE DETERMINED ON SITE.
7. THE POSITIONING OF THE MAIN IS TO BE IN ACCORDANCE WITH THE NATIONAL JOINT UTILITIES GROUP GUIDELINES (NJUG 67)
8. TEST PRESSURE IS 12 BAR AT THE LOWEST POINT
9. ALL WORK IN PRIVATE LAND IS TO BE CARRIED OUT IN ACCORDANCE WITH DCWW'S CODE OF PRACTICE FOR PIPELAYING.
10. THIS DRAWING NEEDS TO BE READ IN CONJUNCTION WITH THE UTILITY INFORMATION PROVIDED SEPARATELY BY THE INDIVIDUAL UNDERTAKERS

DRAWING TO BE READ IN CONJUNCTION WITH:

Key:

- Existing water main
- Abandoned water main
- Water main to be abandoned
- Proposed water main - Opencut
- Proposed water main - Directional Drill
- Proposed water main - Pipeburst
- Proposed water main - Slipline
- Existing Communication Pipe
- Proposed Communication Pipe
- Contractors Access
- Trial Hole Position
- SSSI, Scheduled Ancient Monument
- Contaminated Land
- Great Crested Newt Restrictions
- Archaeological Restrictions
- Badger Sets
- Mine Shafts

LOCATION PLAN

SAP ID 41044132

POST CODE LL53 8TG

Rev.	Date.	Drawn.	Description.	Checked.	Approved.	Date.
B	26/09/12	JP	CONSTRUCTION ISSUE	MK	MK	25/09/12
A	07/07/12	JP	DESIGN/TENDER ISSUE	MK	MK	25/07/12
01	12/06/12	JP	TRIAL HOLE ISSUE	MK	MK	12/06/12

Drawing Status.

CONSTRUCTION ISSUE

Dŵr Cymru
Welsh Water

CAPITAL DELIVERY TEAM
ONE TALBOT GATEWAY
BAGLAN ENERGY PARK
SEAWAY PARADE
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Scheme.

AMP 5 YEAR 3, MIPC NORTH AREA 2
GARNFADRYN PUMPING STATION
WATER MAIN RENEWAL

Drawing Title. ROUTE PLAN

Scale. AS SHOWN		Designer. J PROUT
Checked.	Approved.	Date. APR '12
Drawing Number. NP2900364 - 107		Rev. B

VERSION 1.1, Oct 2011

FIELD 01
FIELD 02
FIELD 03
FIELD 04
FIELD 05
FIELD 06
FIELD 07

FOR CONNECTION ARRANGEMENT SEE DETAIL C

NEW MAIN TO BE PIPEBURST IN ROAD

NEW MAIN TO BE PIPEBURST IN FIELD

NOTE
ARCHAEOLOGICAL WATCHING BRIEF TO BE MAINTAINED ON THIS SCHEME

PREFERRED METHOD OF CONSTRUCTION
PIPEBURST EXISTING 3&"AC WITH 90mm HPPE
63mm RIDER REQUIRED
APPROX 460m

LR PIT 01
LR PIT 02
LR PIT 03
LR PIT 04
LR PIT 05
LR PIT 06
LR PIT 07
LR PIT 08

OPEN CUT 01
OPEN CUT 02

ZIN. AC 1960 (1)
4IN. AC 1960
3IN. AC 1960
6IN. AC 1960

GARN FADRYN LOW
GARN FADRYN LLANIESTYN
30A22003
30A22004
30A22005

ROUTE PLAN
Scale 1:1250 Grid Ref 227787, 334466

Figure 02: Reproduction of client drawing NP 2900364 - 107,with GAT amendments detailing location of trial (LR) pits and open cut areas along the water mains renewal route. Note LR pits and Open Cuts not to scale

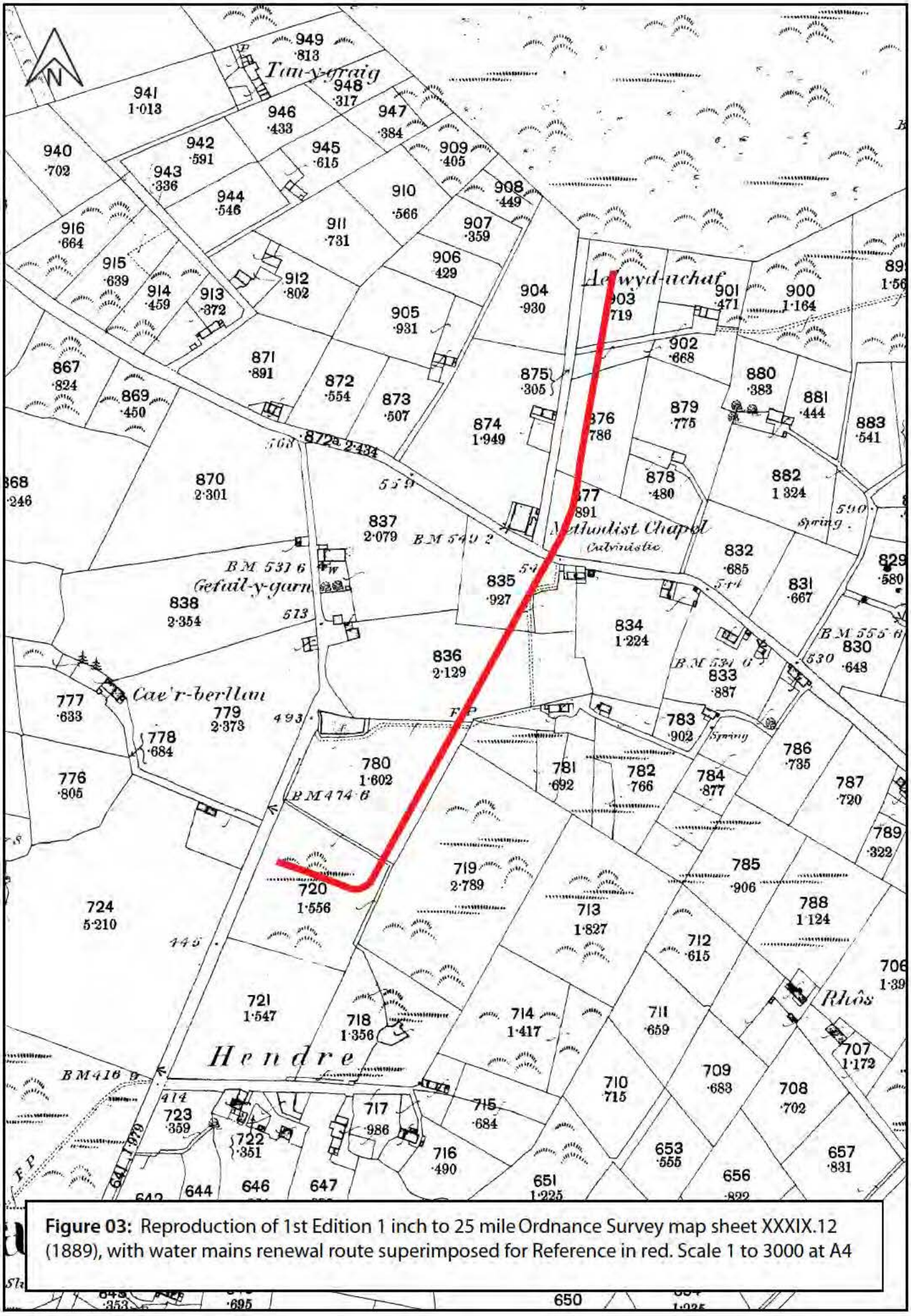


Figure 03: Reproduction of 1st Edition 1 inch to 25 mile Ordnance Survey map sheet XXXIX.12 (1889), with water mains renewal route superimposed for Reference in red. Scale 1 to 3000 at A4

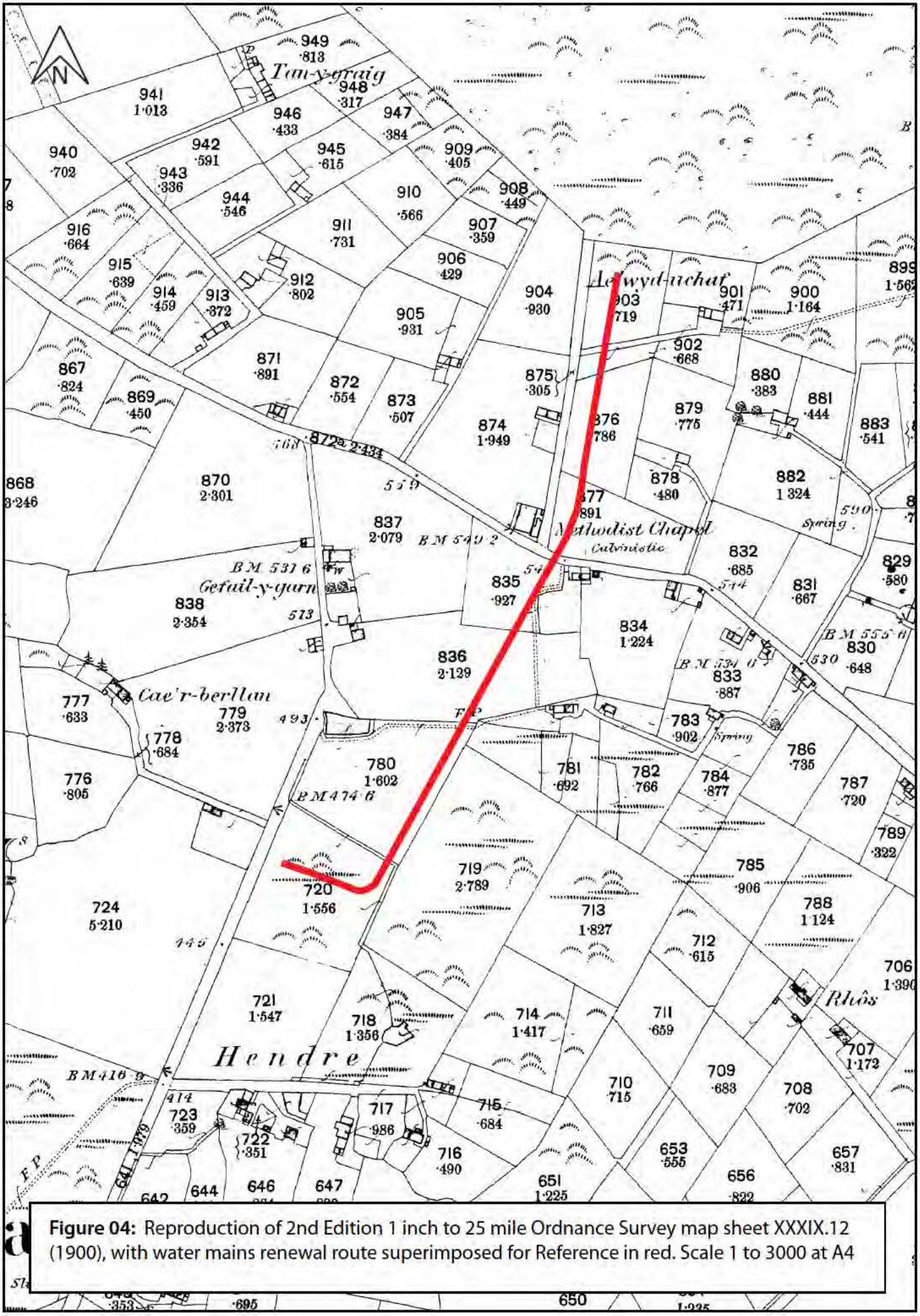


Figure 04: Reproduction of 2nd Edition 1 inch to 25 mile Ordnance Survey map sheet XXXIX.12 (1900), with water mains renewal route superimposed for Reference in red. Scale 1 to 3000 at A4

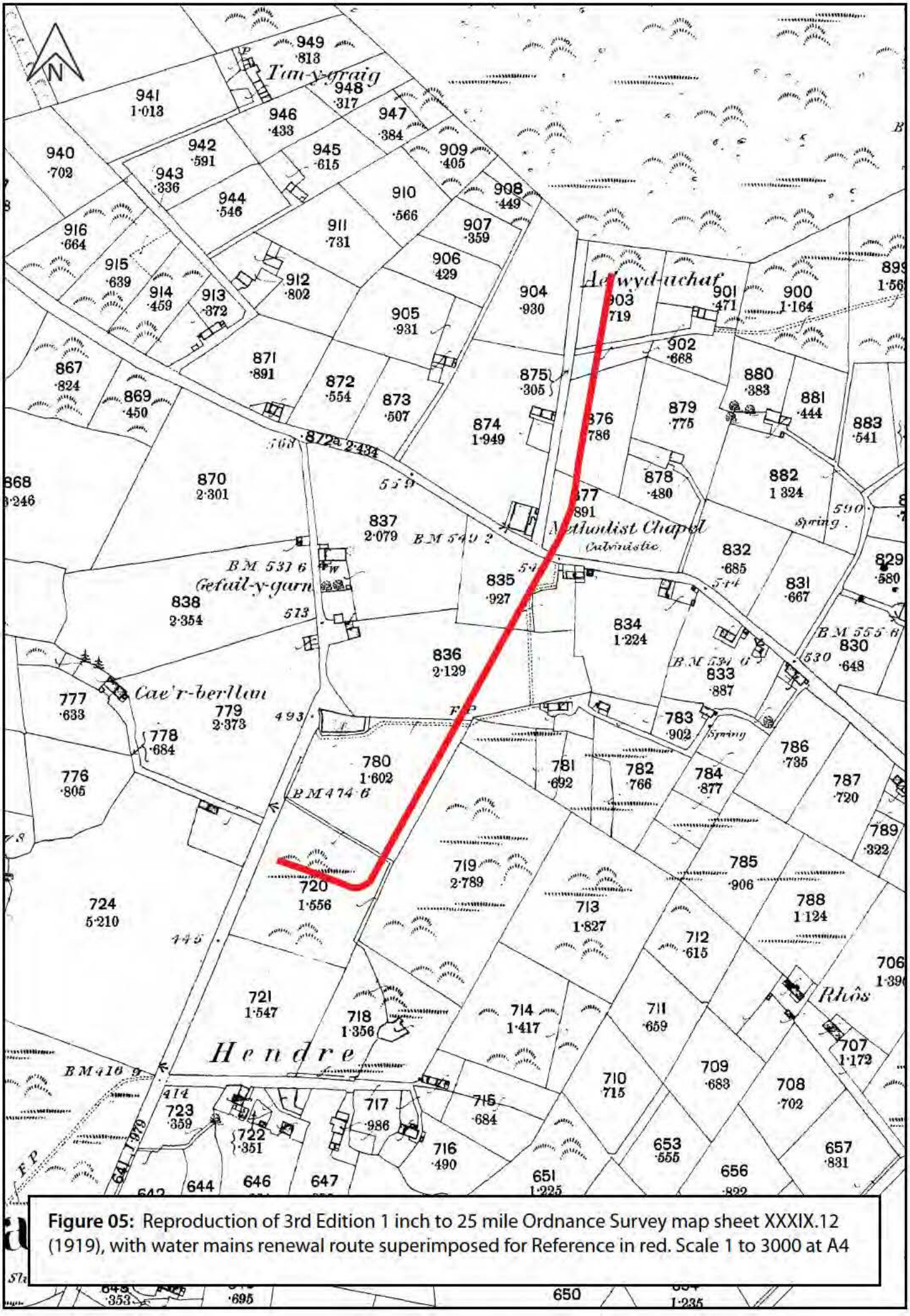


Figure 05: Reproduction of 3rd Edition 1 inch to 25 mile Ordnance Survey map sheet XXXIX.12 (1919), with water mains renewal route superimposed for Reference in red. Scale 1 to 3000 at A4

Plate 1: Field 1/pit 1 - south facing section detailing topsoil, subsoil, 1960' water main and valve. Scale = 1 metre.

Plate 2: southern reservoir compound/pit 2 - south facing section detailing topsoil and disturbed subsoil with building debris. Scale = 1 metre.

Plate 3: Pit 3/Field 2 - South facing section, detailing topsoil, subsoil, natural and existing 1960's main. Scale = 1 metre.

Plate 4: Pit 4/Field 3 - West facing section, detaiing limit of excavation and water ingress. Visible in section is extensive overburden associated with a local residential build. Beneath the overburden is existing topsoil and subsoil.
Scale = 1 metre

Plate 5: Breakthrough of wall at Northern end of Field 4 showing West facing section. The wall forms a boundary with the local road which is visible on the far left of the picture. Scale = 1 metre.

Plate 6: Pit 5/Field 4 - East facing section, detailing topsoil, subsoil and 1960's water main. The pit was waterlogged and a submersible pump is visible at the bottom of the pit. Scale = 1 metre.

Plate 7: Pit 6/Field 5 - West facing section detailing topsoil, subsoil and disturbed ground associated with 1960's water main which is visible on the left of the picture. The base of the pit is waterlogged. Scale = 1 metre.

Plate 8: Pit 7/Field 6 - north west facing section, detailing topsoil, disturbed subsoil and natural deposits, and 1960's water main visible in the bottom of the pit. Scale = 1 metre. Board should read Field 6

Plate 9: Pit 8/Field 7 - detailing topsoil, subsoil and ingress of water. The pit is located immediately to the south of a drainage ditch in a very wet field. The new main is visible on the right of the picture. View from the South.

Plate 10: Open cut trench A/Field 4 - view to the South and Pit 5 from the Northern boundary wall. A domestic service pipe can be seen crossing the trench which is waterlogged at the base.

Plate 11: Open cut trench B/Field 7 - South facing section detailing topsoil, subsoil, the new pipe can be seen in the base of the trench which was waterlogged. Scale = 1 metre.

Plate 12: Open cut trench B/Field 7 - view to the East North East showing new pipe in the bottom of the trench. The trench had been waterlogged and was pumped out with a submersible pump which can be seen in the foreground alongside the pipe. The trench was approximately 40 metres long, 0.5 metres wide, and between 1 metre and 1.2 metres deep.
Scale = 1 metre.

APPENDIX I

Reproduction of Gwynedd Archaeological Trust project design, Garnfadryn Pumping Main Renewal, September 2012

GARNFADRYN PUMPING MAIN RENEWAL

PROJECT DESIGN FOR ARCHAEOLOGICAL WATCHING BRIEF (G2290)

Prepared for

Dŵr Cymru

September 2012

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

GARNFADRYN PUMPING MAIN RENEWAL

PROJECT DESIGN FOR ARCHAEOLOGICAL WATCHING BRIEF (G2290)

Prepared for *Dŵr Cymru*, September 2012

1.0 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by *Dŵr Cymru* to provide a cost and project design for completing an archaeological watching brief during the groundworks for a pumping water mains renewal (PMR) programme at Garnfadryn, Llŷn Peninsula, Gwynedd (centred on NGR **SH27783446**); as located on *Dŵr Cymru* Drawing No. **NP2900364-107**). The groundworks are to be completed by *Mulcair* and the scheme is scheduled between 05/11/2012 and 12/12/2012.

The scheme consists of the replacement of approximately 460.0m of existing water main and runs southwards from a covered reservoir, through three fields, across a local road to continue south-southwest across three more fields before diverting west to a second covered reservoir. The proposed methodology is to pipeburst the existing 3" main, with open cutting limited to the reservoir compound and at connection points along the route.

A mitigation brief has not been prepared for this work by **The Gwynedd Archaeological Planning Services** (GAPS), but GAPS has recommended a programme of archaeological monitoring (watching brief) during groundworks due to the proximity of known archaeology (see para. 3.0 for a methodology).

Reference will also be made to the guidelines specified in *Standard and Guidance for Archaeological Watching Brief* (Institute for Archaeologists, 1994, rev. 2001 & 2008).

1.1 Background

The northern end of the scheme is located to the immediate south of Scheduled Ancient Monument **CN011**: Carn Fadryn Camp (centred on NGR **SH28003520**), a prehistoric defensive enclosure. A prehistoric unenclosed hut circle settlement is also located *c.*1.2km to the southeast of the scheme (**CN071**: Hut Circle Settlement at Pen-y-Caerau; NGR **SH29003430**), whilst a defensive prehistoric enclosure is located *c.*2.4km to the southeast of the scheme (**CN408**: Carn Saethon; NGR **SH29703370**). An enclosed hut circle settlement is also located *c.*1.2km to the south-southeast of the scheme (**CN276**: Enclosed Hut Group South of Penbodlas; NGR **SH28603330**).

2.0 REQUIREMENTS

The **watching brief** will consist of the following:

- Observation of non-archaeological excavation works.
- A drawn, written and photographic record of any archaeological structures and deposits that may be revealed.
- Preparation of full archive report.

The monitoring of works is to be undertaken in a manner that allows for the immediate cessation of groundworks for the recording of archaeological evidence, if identified.

The subsequent report should include:

1. A copy of the agreed specification;
2. A location plan;
3. A drawn, written and photographic record of any archaeological structures and deposits that may be revealed, including full dimensional and descriptive detail;
4. Discussion of the archaeological significance and research potential of any findings;
5. A full bibliography of sources consulted.

3.0 METHOD STATEMENT

3.1 Definition of an archaeological watching brief

(Reproduced from IFA. 2001. *Institute for Archaeologists 1994 rev. 2001 and 2008 Standard and Guidance for an archaeological watching brief)*

The definition of an archaeological watching brief is a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

This definition and *Standard* do not cover chance observations, which should lead to an appropriate archaeological project being designed and implemented, nor do they apply to monitoring for preservation of remains *in situ.*

An archaeological watching brief is divided in to four categories according to the *Institute for Archaeologists 2001 Standard and Guidance for an archaeological watching brief:*

- comprehensive (present during all ground disturbance)
- intensive (present during sensitive ground disturbance)
- intermittent (viewing the trenches after machining)
- partial (as and when seems appropriate).

An **intensive** watching brief is recommended for the scheme. In this instance, this would be during the open cutting elements, including the reservoir compound and the connection points (inc. launch/reception pits for the pipebursting)

3.2 Purpose of a watching brief

The purpose of a watching brief is:

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

The objective of a watching brief is:

- to establish and make available information about the archaeological resource existing on a site.

3.3 Occurrence

A watching brief may arise:

- in response to a development which threatens the archaeological resource
- as part of the planning process (within the framework of appropriate national planning policy guidance notes) and/or development plan policy
- as part of an Environmental Impact Assessment (EIA)
- outside the planning process (e.g. ecclesiastical development, coastal erosion, agriculture, forestry and countryside management, works by public utilities and statutory undertakers). A watching brief may therefore be instigated or commissioned by a number of different individuals or organisations, including local planning authorities, national advisory bodies, government agencies, private landowners, developers or their agents.

3.4 Methodology

3.4.1. Archaeological Watching Brief

- **The watching brief is to be undertaken in a manner that allows for the immediate cessation of the main contractor groundworks for the recording of archaeological evidence. This will involve close liaison between the archaeologist and the site agent.**

- A photographic record will be maintained throughout, using a digital SLR camera set to maximum resolution.

- Any subsurface remains will be recorded photographically, with detailed notations and a measured survey.

The archive will then be held by GAT under an appropriate project number (G2290)

4.0 FURTHER ARCHAEOLOGICAL WORKS

- **The identification of significant archaeological features during the groundworks/archaeological watching brief may necessitate further archaeological works. This may require the submission of new cost estimates to the contractor.**
- **This design does not include a methodology or cost for examination of, conservation of, or archiving of finds discovered during the watching brief, nor of any radiocarbon dates required, nor of examination of palaeoenvironmental samples. The need for these will be identified in the post-fieldwork programme (if required), and a new design will be issued for approval by the GAPS Archaeologist.**

5.0 ENVIRONMENTAL SAMPLES

If necessary, relevant archaeological deposits will be sampled by taking bulk samples (a minimum of 10.0 litres and maximum of 30.0 litres) for flotation of charred plant remains. Bulk samples will be taken from waterlogged deposits for macroscopic plant remains. Other bulk samples, for example from middens, may be taken for small animal bones and small artefacts.

6.0 HUMAN REMAINS

Any finds of human remains will be left *in-situ*, covered and protected, and both the coroner and the GAPS Archaeologist informed. If removal is necessary it will take place under appropriate regulations and with due regard for health and safety issues.

7.0 SMALL FINDS

The vast majority of finds recovered from archaeological excavations comprise pottery fragments, bone, environmental and charcoal samples, and non-valuable metal items such as nails. Often many of these finds become unstable (i.e. they begin to disintegrate) when removed from the ground. All finds are the property of the landowner, however, it is Trust policy to recommend that all finds are donated to an appropriate museum where they can receive specialist treatment and study. Access to finds must be granted to the Trust for a reasonable period to allow for analysis and for study and publication as necessary. All finds would be treated according to advice provided within *First Aid for Finds* (Rescue 1999). Trust staff will undertake initial identification, but any additional advice would be sought from a wide range of consultants used by the Trust, including National Museums and Galleries of Wales at Cardiff.

8.0 PROCESSING DATA, ILLUSTRATION, REPORT AND ARCHIVING

Following completion of the watching brief as outlined above, a report will be produced incorporating the following:

- Non-technical summary
- Introduction
- Specification and Project Design
- Methods and techniques
- Archaeological Background
- Description of the results of the watching brief
- Summary and conclusions
- Bibliography of sources consulted.

Illustrations, including plans and photographs, will be incorporated within the report.

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared. All plans, photographs and descriptions will be labelled and cross-referenced, and lodged in an appropriate place (to be decided in consultation with the regional Historic Environment Record) within six months of the completion of the project. All digital data will be written to CD-ROM and stored with the paper archive.

- one or more copies (as required) will be sent to the client

- one or more copies (as required) will be sent to GAPS

- one or two copies (as required) sent to the Historic Environment Record Archaeologist for the area (HER, Gwynedd Archaeological Trust, Craig Beuno, Bangor, Gwynedd LL57 2RT);

- copies of all key digital files on optical media should be provided to GAPS and the Regional HER, including report, photographs, scans of maps etc.

- a copy of the report and/or digital files on optical media should be provided to the National Monument Record (Royal Commission on the Ancient and Historic Monuments of Wales, Aberystwyth, SY23 1NJ) dependant upon their requirements.

9.0 STAFF

The project will be supervised by a Senior Archaeologist at GAT Contracts Section. The work will be carried out by fully trained Project Archaeologists who are experienced in conducting watching briefs and working with contractors and earth moving machinery. (Full CV's are available upon request).

10.0 HEALTH & SAFETY

The Trust subscribes to the SCAUM (Standing Conference of Archaeological Unit Managers) Health and Safety Policy as defined in **Health and Safety in Field Archaeology** (1999).

11.0 INSURANCE

Liability Insurance - Aviva Policy 24765101CHC/00045

- Employers' Liability: Limit of Indemnity £10m in any one occurrence
- Public Liability: Limit of Indemnity £5m in any one occurrence
- Hire-in Plant Insurance: £50,000.00 any one item;
  £250,000.00 any one claim

The current period expires 21/06/13

Professional Indemnity Insurance – RSA Insurance Plc P8531NAECE/1028

- Limit of Indemnity £5,000,000 any one claim

The current period expires 22/07/13

12.0 SOURCES CONSULTED

Client drawings: *Dŵr Cymru* Drawing No. **NP2900364-107**

Gwynedd Archaeological Trust: Historic Environment Record

Standard and Guidance for Archaeological Watching Brief (Institute for Archaeologists, 1994, rev. 2001 & 2008)

GARNFADRYN PUMPING MAIN RENEWAL

PROJECT DESIGN FOR ARCHAEOLOGICAL WATCHING BRIEF (T0223)

Prepared for *Dŵr Cymru*, September 2012

COST ESTIMATE

The costs below are based on standard time for 7.5 hours (£XX/hour), between 0830hrs and 1630hrs and include travel. Any overtime including Saturdays will be charged at time and a half (£XX/hour); Sundays and Public/Bank Holidays will be charged at £XXhour. Management time will be charged at £XX/hour.

The works will be completed by *Mulcair* and are scheduled between 05/11/2012 and 12/12/2012 (6 weeks)

Watching Brief (1 member of staff @ £XX/hour based on a7.5hr day)

Labour 5 site days **£**

Report, illustration and archiving (1 member of staff @ £XX/hour based on a 7.5hr day)

Labour 2 office days **£**

Management time (1 member of staff @XX/hour based on a 7.5hr day)

Labour 0.5 office day **£**

TOTAL **£**

VAT will be added at the appropriate rate.

Please note the following:

- **This price does not include any time that may be required to examine features uncovered during the watching brief. <u>The identification of significant archaeological features may necessitate the production of a new project design and the submission of new costings to the contractor</u>**
- **The Trust will not be held responsible for any delays to the work programme resulting from the discovery of archaeological sites or finds.**
- **The cost quoted does not include examination of, conservation of or archiving of finds discovered during the watching brief, nor of any radiocarbon dates required, nor of examination of palaeoenvironmental samples.**

Figure 01

Reproduction of Dŵr Cymru Drawing No. NP2900364-107

HAZARD WARNINGS

(IN LINE WITH DESIGNERS RESPONSIBILITIES UNDER CDM REGS 2007)

- CONNECTING ONTO A PRESSURISED MAIN

RESIDUAL RISKS

1	
3	

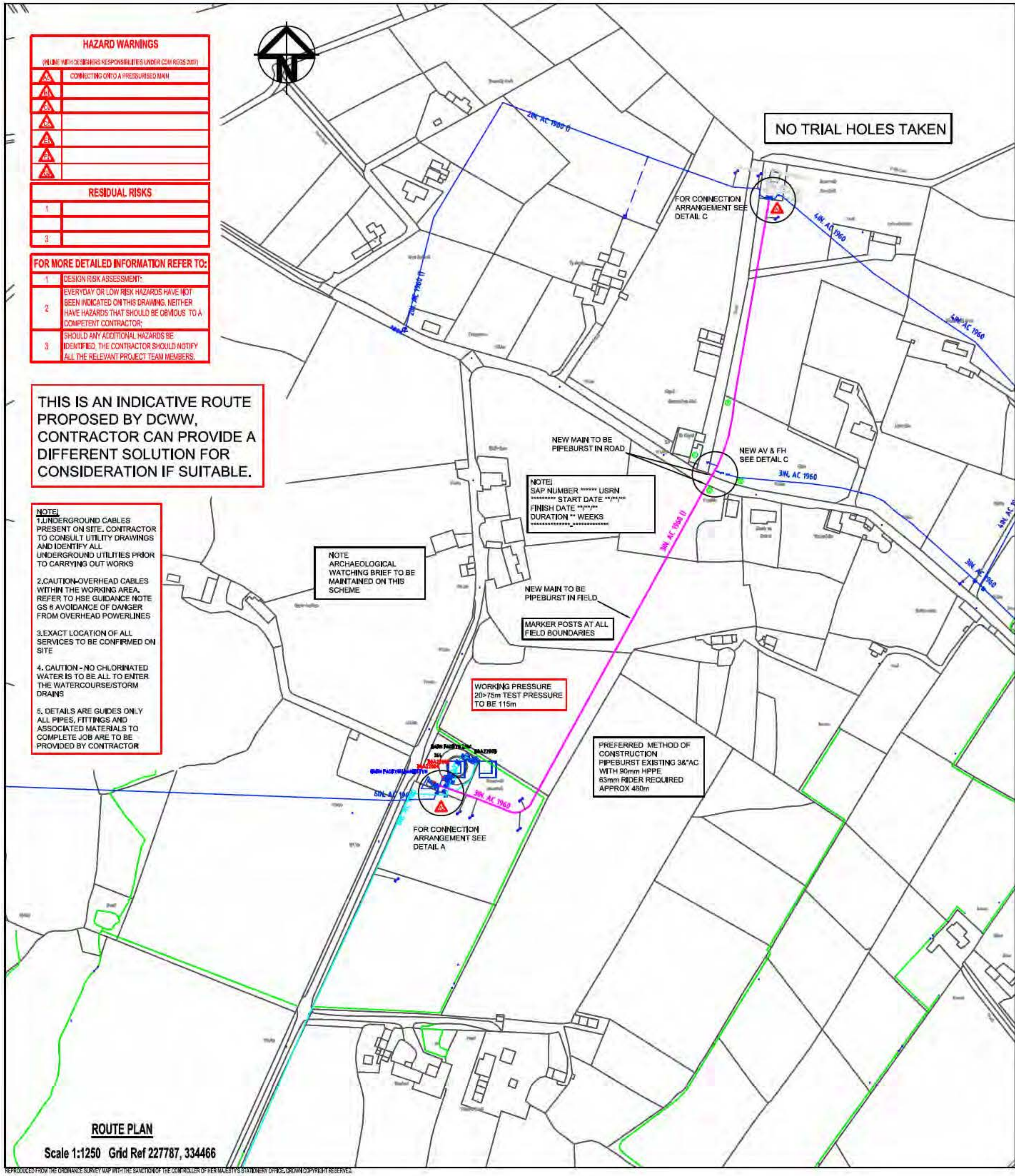
FOR MORE DETAILED INFORMATION REFER TO:

1	DESIGN RISK ASSESSMENT:
2	EVERYDAY OR LOW RISK HAZARDS HAVE NOT BEEN INDICATED ON THIS DRAWING, NEITHER HAVE HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR:
3	SHOULD ANY ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL THE RELEVANT PROJECT TEAM MEMBERS.

THIS IS AN INDICATIVE ROUTE PROPOSED BY DCWW, CONTRACTOR CAN PROVIDE A DIFFERENT SOLUTION FOR CONSIDERATION IF SUITABLE.

NOTE:

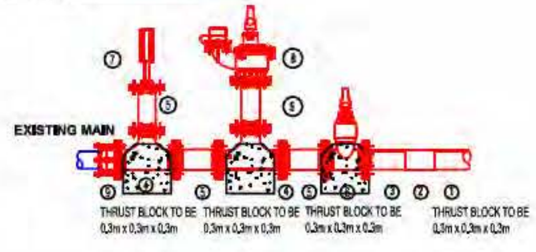
1. UNDERGROUND CABLES PRESENT ON SITE. CONTRACTOR TO CONSULT UTILITY DRAWINGS AND IDENTIFY ALL UNDERGROUND UTILITIES PRIOR TO CARRYING OUT WORKS
2. CAUTION-OVERHEAD CABLES WITHIN THE WORKING AREA. REFER TO HSE GUIDANCE NOTE GS 6 AVOIDANCE OF DANGER FROM OVERHEAD POWERLINES
3. EXACT LOCATION OF ALL SERVICES TO BE CONFIRMED ON SITE
4. CAUTION - NO CHLORINATED WATER IS TO BE ALL TO ENTER THE WATERCOURSE/STORM DRAINS
5. DETAILS ARE GUIDES ONLY ALL PIPES, FITTINGS AND ASSOCIATED MATERIALS TO COMPLETE JOB ARE TO BE PROVIDED BY CONTRACTOR



ROUTE PLAN

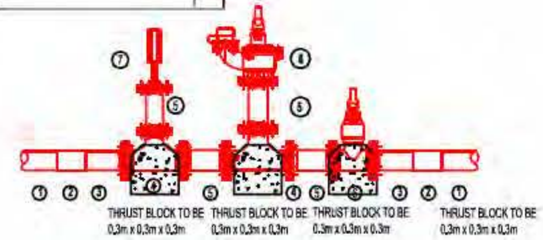
Scale 1:1250 Grid Ref 227787, 334466

1.	90mm od 10 BAR PROFUSE PIPE	•
2.	90mm od ELECTROFUSION COUPLER	1
3.	90mm od PUPPED FLANGE	1
4.	80mm DIA ALL FLANGE TEE	2
5.	80mm DIA DISTANCE PIECE 250mm LONG	4
6.	80mm DIA SLUICE VALVE	1
7.	1" AIR VALVE BY INDUSTRIAL VALVES	1
8.	FIRE HYDRANT	2
9.	90mm AQUAGRIP	1



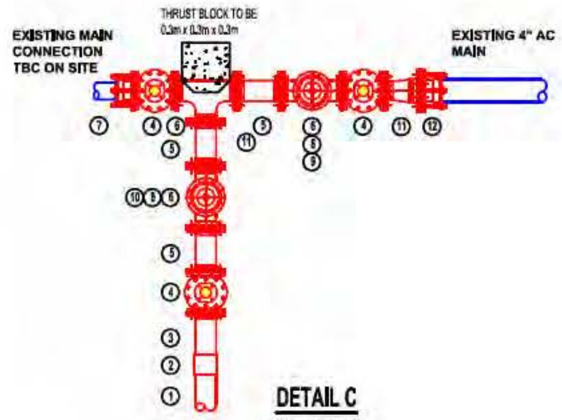
DETAIL A
Scale 1:20

1.	90mm od 10 BAR PROFUSE PIPE	•
2.	90mm od ELECTROFUSION COUPLER	2
3.	90mm od PUPPED FLANGE	2
4.	80mm DIA ALL FLANGE TEE	2
5.	80mm DIA DISTANCE PIECE 250mm LONG	4
6.	80mm DIA SLUICE VALVE	1
7.	1" AIR VALVE BY INDUSTRIAL VALVES	1
8.	FIRE HYDRANT	1



DETAIL B
Scale 1:20

1.	90mm o.d. 10 BAR HPPE PIPE	•
2.	90mm o.d. ELECTRO FUSION COUPLING	1
3.	90mm o.d. PUPPED FLANGE	1
4.	80mm DIA. ACC SLUICE VALVE	3
5.	80mm DIA. DF DISTANCE PIECE 250 LONG	3
6.	80mm ALL FLANGE TEE	3
7.	90MM AQUAGRIP	1
8.	80mm DIA. DF DISTANCE PIECE 250 LONG	2
9.	80mm AV	1
10.	80mm HYDRANT	1
11.	100 - 80mm DIA. FLANGE TAPER	1
12.	100mm VJ FLANGE ADAPTOR	1



DETAIL C
Scale 1:20

A1

ALL MEASUREMENTS ARE APPROXIMATE.

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE FOLLOWING DCWW SPECIFICATIONS:
   a. THE CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY REVISION 6 (CESWI 6)
2. DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
4. REPRODUCED FROM THE ORDNANCE SURVEY'S MAPS WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. CROWN COPYRIGHT.
5. THE EXACT LOCATION OF ALL EXISTING APPARATUS IS TO BE DETERMINED ON SITE.
6. LOCATION OF CONNECTIONS TO BE DETERMINED ON SITE.
7. THE POSITIONING OF THE MAIN IS TO BE IN ACCORDANCE WITH THE NATIONAL JOINT UTILITIES GROUP GUIDELINES (NJUG 67)
8. TEST PRESSURE IS 12 BAR AT THE LOWEST POINT
9. ALL WORK IN PRIVATE LAND IS TO BE CARRIED OUT IN ACCORDANCE WITH DCWW'S CODE OF PRACTICE FOR PIPELAYING.
10. THIS DRAWING NEEDS TO BE READ IN CONJUNCTION WITH THE UTILITY INFORMATION PROVIDED SEPARATELY BY THE INDIVIDUAL UNDERTAKERS

DRAWING TO BE READ IN CONJUNCTION WITH:

Key:

- Existing water main
- Abandoned water main
- Water main to be abandoned
- Proposed water main - Opencut
- Proposed water main - Directional Drill
- Proposed water main - Pipeburst
- Proposed water main - Slipline
- Existing Communication Pipe
- Proposed Communication Pipe
- Contractors Access
- Trial Hole Position
- SSSI, Scheduled Ancient Monument
- Contaminated Land
- Great Crested Newt Restrictions
- Archaeological Restrictions
- Badger Sets
- Mine Shafts

LOCATION PLAN

SAP ID 41044132

POST CODE LL53 8TG

Rev.	Date.	Drawn.	Description.	Checked.	Approved.	Date.
B	05/09/12	JP	CONSTRUCTION ISSUE	MK	MK	05/09/12
A	07/07/12	JP	DESIGN/TENDER ISSUE	MK	MK	25/07/12
01	12/06/12	JP	TRIAL HOLE ISSUE	MK	MK	12/06/12

Drawing Status. CONSTRUCTION ISSUE

Dŵr Cymru Welsh Water

CAPITAL DELIVERY TEAM
ONE TALBOT GATEWAY
BAGLAN ENERGY PARK
SEAWAY PARADE
BAGLAN
PORT TALBOT
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Tel: +44 (0) 1639 816800
Fax: +44 (0) 1639 816844

Scheme. AMP 5 YEAR 3, MIPC NORTH AREA 2 GARNFADRYN PUMPING STATION WATER MAIN RENEWAL

Drawing Title. ROUTE PLAN

Scale. AS SHOWN		Designer. J PROUT
Checked.	Approved.	Date. APR '12
Drawing Number. NP2900364 - 107		Rev. B

VERSION 1.1, Oct 2011

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

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