NEFYN WASTE WATER TREATMENT SCHEME (REVISED ROUTE)

ARCHAEOLOGICAL ASSESSMENT:

GEOPHYSICAL SURVEY REPORT

G1760

Report No. 496

Prepared for Symonds Group Ltd

> September 2003 by D. Hopewell



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SUMMARY

An archaeological assessment was carried out in advance of construction of a water treatment works and associated pipelines at Nefyn and Edern, Gwynedd. The report recommended fluxgate gradiometer survey of rare examples of elements of medieval strip field systems preserved in the modern landscape to the south of Morfa Nefyn and to the north of Nefyn. Two possible burial sites, one early Christian and one Bronze Age, lying close to the pipeline route also required further assessment, initially using geophysical survey.

The survey was carried out in all areas apart from the fields to the north of Nefyn and succeeded in its aim of revealing further details of the medieval strip field system. It revealed features relating to the original medieval strip fields and their subsequent development. The detailed results from the survey indicate a fairly high level of subsurface preservation. A possible Bronze Age round barrow was also detected close to the previously known burial site at Pen yr Orsedd. The survey failed to reveal any details of any early Christian burials.

Avoidance remains the preferred option for the medieval field system (feature 20) with an intensive watching brief as a second option, along with keeping ground disturbance to a minimum. Avoidance is also the preferred option for the possible round barrow, with trial trenching and excavation as a second option.

1 INTRODUCTION

Gwynedd Archaeological Trust was asked by Symonds Group to carry out an archaeological assessment in advance of construction of a water treatment works and associated pipeline at Nefyn, Gwynedd. An assessment report was prepared based on the route shown on Symonds Drawing No. 57748/RM/01 (Gwynedd Archaeological Trust report No. 487). The proposed pipeline extends from just south of Edern at SH28023976 to just north of Nefyn at SH31054103 with a treatment works at the Edern end (with a connection to Edern) and a pumping station close to the Nefyn end. The total length of easement is about 3.85km. The exact sizes and locations of the proposed Edern treatment works and Nefyn pumping station are not known, nor is the size and depth of the proposed pipeline.

The area lies just outside the Lleyn Area of Outstanding Natural Beauty but within the Lleyn Peninsula Environmentally Sensitive Area (ADAS 1988). Nefyn had a priory in the 12th century and was a Royal manor or llys of the Welsh kingdom of Gwynedd and a flourishing market town in the 13th and 14th centuries AD. Its importance was underlined by its choice by Edward I as the location for a royal tournament of international status to celebrate his victory over Llywelyn in 1282. The town was unfortunately largely destroyed during the Glyndwr rebellion and the exact sites of the Priory, Royal manor buildings and other contemporary housing still needs to be located. It is a valuable area for historical research in that it retained much of its medieval field systems until the middle of the 19th century and this latter is of particular relevance to the present project.

The assessment report recommended further assessment of the following features using fluxgate gradiometer survey

Burials identified in the nineteenth century, to the north of Edern church, possibly indicating an early ecclesiastical site (feature 37).

Elements of medieval open strip fields (features 20 and 25 to 32) preserved within the present field system to the south of Morfa Nefyn (Fig. 10).

The area around a site where Bronze Age cremation urns were discovered in the late seventeenth century (site 38).

Further elements of medieval open strip fields (feature18) preserved within the present field system to the north of Nefyn (Fig. 9)

2 SPECIFICATION AND PROJECT DESIGN

The basic requirement was for fluxgate gradiometer survey of the pipeline and easement corridor in the vicinity of the sites noted above in order to clarify their extent and nature. Gradiometer survey has the advantage of being non-invasive and relatively swift. It is ideal for detecting larger scale features such as relict field boundaries and enclosure ditches. The effects of ploughing are commonly detected (e.g. Crew 1977, 13). Smaller features such as graves are less commonly detected because of the relatively course resolution $(0.5 \times 1.0m)$ of area survey. Associated features such as enclosures and denuded barrows can be detected and thus provide valuable supporting evidence.

Instrumentation

Geoscan FM36 Fluxgate Gradiometer.

This instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetised iron oxides which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil therefore contain greater amounts of iron and can therefore be detected with the gradiometer. This is a simplified description as there are other processes and materials which can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Strong readings are also produced by archaeological features such as hearths or kilns as fired clay acquires a permanent magnetic field upon cooling. Not all surveys can produce good results as results can be masked by large magnetic variations in the bedrock or soil. and in some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features.

The Geoscan FM36 is a hand held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 500mm apart. Their Mumetal cores are driven in and out of magnetic saturation by a 1,000Hz alternating current passing through two opposing driver coils. As the cores come out of saturation the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output (Clark 1990).

The gradiometer can detect anomalies down to a depth of approximately one metre. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT, typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The machine is capable of detecting changes as low as 0.1nT.

Data Collection

The gradiometer includes an on-board data-logger. Readings in the surveys were taken along parallel traverses of one axis of a 20m x 20m grid. The traverse interval was one metre. Readings were logged at intervals of 0.5m along each traverse giving 800 readings per grid.

Data presentation

The data is transferred from the data-logger to a computer where it is compiled and processed using Geoplot software. The following display option is used in this report along with an interpretation drawing.

Grey-Scale plot

Data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed. A smoothed version of the above may also be included. This does not contain any additional information; its function is to suppress the random background noise allowing anomalies to be seen more clearly.

Data Processing

The data is presented with a minimum of processing. High readings caused by stray pieces of iron, fences, etc are usually modified on the grey scale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. Corrections are also made to compensate for instrument drift and other data

collection inconsistencies. Any further processing is noted in relation to the individual plot. The plots in this report have been interpolated to 0.5×0.5 m spacing in order to reduce pixellation.

3. **RESULTS**

Seven areas were surveyed (A to G, Fig. 2). The fields north of Nefyn (H and I) were unsuitable for survey because they contained a crop of turnips with heavy regrowth of rape. It is proposed that the survey will be carried out when the crop has been harvested.

The background noise levels generated by the topsoil throughout the survey were low and did not significantly affect the results

Survey Area A

A roughly rectangular area with dimensions of 125m x 40m was surveyed in an attempt to discover features associated with the burials identified in the nineteenth century, to the north of Edern church (feature 37). It should be noted that no survey was carried out at the site of the Edern treatment works due to the presence of an iron pipe and manhole cover.

Survey Conditions

Survey conditions were good with fine weather and short grass in a fairly level field.

Area A survey results (Figs 3 and 4)

A single narrow linear anomaly was detected that is best interpreted as a land drain.

Survey Area B

A roughly rectangular area with dimensions of 80m x 40m was surveyed in an attempt to gain more information about the medieval strip field system in this area (feature 20).

Survey Conditions

Survey conditions were good with fine weather and short grass in a level field.

Area B survey results (Figs 5 and 6)

A series of three linear anomalies running approximately north south are visible on the grey-scale plot. The central anomaly corresponds to a field boundary shown on the 1839 tithe map (Fig 10, western side). The other two anomalies are not quite as clear but can probably also be interpreted as boundaries. A series of faint linear anomalies running parallel to the relict boundaries are the result of ploughing. Two of these anomalies are slightly better defined and could be interpreted as further divisions within the strip field system.

Survey Area C

A roughly rectangular area with dimensions of 100m x 40m was surveyed in an attempt to gain more information about the medieval strip field system in this area (feature 20).

Survey Conditions

Survey conditions were good with fine weather and short grass in a level field.

Area C survey results (Figs 5 and 6)

A single linear anomaly running approximately east-west can be seen to bisect the field longitudinally. This is very similar to the central anomaly in area B that can be shown to be a relict boundary. This feature should therefore be similarly interpreted. A further linear boundary type anomaly along with a strong anomaly corresponds to the obviously removed section of field bank on the south side of the field. The strong anomaly could be the result of a burning the wood from the hedgerow. Plough scarring is again

visible and one slightly stronger anomaly in the former southernmost field could represent a subdivision shown on the tithe map (Fig 10, western side).

Survey Area D

A rectangular area with dimensions of 60m x 40m was surveyed in an attempt to gain more information about the medieval strip field system in this area (feature 20).

Survey Conditions

Survey conditions were fairy good although the field was somewhat overgrown. The edges of the field were not accessible due to brambles and blackthorn.

Area D survey results (Figs 5 and 6)

The irregular anomalies on the grey scale plot are typical responses from underling bedrock or changes in the subsoil. A few very faint ploughscars are also visible.

Survey Area E

A roughly rectangular area with dimensions of 160m x 40m was surveyed in an attempt to gain more information about the medieval strip field system in this area (feature 20).

Survey Conditions

This field was quite overgrown with long ungrazed/uncut grass, patches of nettles and numerous tall ragwort plants. The nettles were cut down before the survey was carried out. The other vegetation impeded the gradiometer and added a noticeable amount of directional and tilt error. The added 'noise' did not result in serious masking of the anomalies in the field.

Area E survey results (Figs 5 and 6)

A single linear anomaly running approximately east-west can be seen to bisect the field longitudinally. This can again be interpreted as a relict boundary. A further intermittent faint linear anomaly to the north of this could represent a further subdivision. Plough scarring is again visible, running parallel to the relict boundaries.

Survey Area F

A roughly rectangular area with dimensions of 100m x 40m was surveyed in an attempt to gain more information about the medieval strip field system in this area (feature 20).

Survey Conditions

Survey conditions were good with fine weather and short grass in a sloping field.

Area F survey results (Figs 7 and 8)

The most obvious feature in area F is a strong alternating positive and negative anomaly indicating a cast iron water pipe running to the farm. The eastern end of the pipe cuts a fairly well defined circular anomaly. This sits on the top of a break of slope in the field and could be a Bronze Age round barrow. This part of the field also contains another short linear feature suggesting further subsurface remains. Interpretation is however difficult because of masking by the strong readings from the pipe. A further linear anomaly at the north of the area could be a field boundary. Plough scarring is quite prominent in this field running in an east-west direction and curving towards the western boundary.

A roughly rectangular area with dimensions of 100m x 40m was surveyed in an attempt to gain more information about the medieval strip field system in this area (feature 20).

Survey Conditions

Survey conditions were good. The weather was fine and the field was slightly overgrown but level.

Area G survey results (Figs 7 and 8)

A single linear boundary-type anomaly running approximately east-west bisects the field and plough scarring is clearly visible in all but the northern part of the field.

The tithe map (fig. 10) shows a different alignment for the northern boundary of the field (field no.266) and suggests that a track or road formerly ran into the northern part of it. The geophysical survey did not however detect any sign of the track or associated boundaries.

Areas H and I

These areas were not surveyed due to the presence of a crop in the fields.

4. CONCLUSIONS

The geophysical survey succeeded in its aim of revealing further details of the medieval strip field system and its subsequent development. The detailed results from the survey clearly indicate a fairly high level of subsurface preservation. Most of the fields in areas B to G showed a central longitudinal sub division and in some cases a further longitudinal subdivision. These features clearly predate the tithe map and presumably have their origins in the medieval open strip fields. It is interesting to note that the divisions are of a fairly even width i.e. about 20-22m (i.e. about one chain or 22 yards) with further subdivisions giving strips of 10-11m. This is fairly close to the 13m wide quillets or *lleniau* recorded by Longley at Rhosyr on Anglesey (Longley 2001, 48). The fields containing survey areas C and D are both 180m (191 yds) long thus falling short of a furlong (220yd) that would equal a 1 acre field. Clearly, this data would benefit from further analysis and comparative study. This is however beyond the brief of the geophysical survey report.

The possible barrow in area F could reflect further Bronze Age funerary and ritual activity in the area around the previous discovery of a cist at Pen yr Orsedd (feature 38). It should be noted that this interpretation is unconfirmed and would have to be tested by excavation.

The survey failed to find any evidence for burials associated with Edern church. It should be noted that lack of evidence from geophysical survey cannot be taken as proof of lack of archaeological features. Some features may be too small or may not contain material that is magnetically different from the surrounding soil. These features would therefore fail to show up as anomalies on the survey.

5. FURTHER MITIGATORY RECOMMENDATIONS

The survey revealed no evidence for burials in area A but an intensive watching brief is still recommended for the reasons noted above.

The geophysical survey confirms the survival of features relating to the medieval strip field system. The previous report (GAT 487) recommended avoidance as the preferred option for the field system (feature 20) with an intensive watching brief allowing time for the recording of any features that emerge as an acceptable alternative if avoidance is not possible. The survey confirms these recommendations. If the second option is taken up it is recommended that ground disturbance is kept to a minimum. Consideration should be given to avoiding the creation of a wide topsoil stripped easement and minimising disturbance to the lower ploughsoil should be a priority. The pipeline trench itself would have a fairly minor impact on the subsoil features being fairly narrow but the damage cause by vehicles and other plant could be extensive particularly in wet weather.

Further historical analysis of the findings of the geophysical survey in relation to the development of the field system is recommended as part of a final report containing the results of the archaeological recording on this scheme.

The possible barrow in area F could probably be avoided by the works and this is the preferred mitigatory recommendation. If this is not possible, excavation in advance of the works would be an acceptable alternative. It should be noted that trial trenching would be the initial requirement if avoidance is not possible in order to confirm the geophysical survey interpretation.

6. RECOMMENDATIOS FOR FURTHER ASSESSMENT

Geophysical survey has still to be carried out in the fields to the north of Nefyn (areas H and I). This is expected to be carried out later in the year when the crop has been lifted. Mitigatory recommendations should provisionally be the same as for feature 20 i.e. avoidance as the preferred option with an intensive watching brief and an attempt to minimise ground disturbance as an alternative.

7. REVISED SUMMARY OF RECOMMENDATIONS

Further assessment

• Geophysical survey (gradiometer) Features 11, 13 and 18

Mitigatory recommendations

- Avoidance (preferred option) Feature 20 (provisionally 11,13 and 18), possible round barrow near feature 38.
- Intensive watching brief Features 3, 37, 20 25, 26, 27, 28, 29, 30 31, 32, 38, 11, 13, 14, 15, 17, and 18.
- Excavation (second option) possible round barrow near feature 38.
- Partial watching brief Entire route where no other mitigation
- Re-instatement Features 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36.
- None Features 12, 16

8. BIBLIOGRAPHY

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Fig. 1 Location of archaeological and historical features identified during the initial assessment (GAT report 487, 2003) Reproduced from Ordnance Survey 1:10,000 scale maps. Crown copyright. All rights reserved. Licence no. AL 100020895.



Fig. 2 Nefyn Scheme showing location of geophysical survey areas















Fig. 9 Nefyn town, 1815, showing surviving Medieval strip field holdings (Glynllifon 1815). (North to top of map)



Fig.10 South of Morfa Nefyn, part of Nefyn parish tithe map, 1839, showing area of relict strip fields and route of pipeline (North to top of map).



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