

# **LLECHWEDD SLATE MINE COMPLEX**

**Environment Act 1995 - Review of Mineral Planning Permissions**

**Operational Programme and Landscape Strategy**



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in association with

*Cynefin*  
*Environmental*



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## **Introduction**

*General background*

*Planning permission*

*Planning conditions*



## Introduction

### General background

- i The Llechwedd Slate Mines Complex was created through an amalgamation of the former Maenofferen, Llechwedd, Votty and Bowydd and Diphwys Casson mining operations. The location of the complex is indicated on the accompanying plan LLECH.97.01. Diphwys Casson is the oldest of the four and commenced operations around 1760. All four were operating by the early 19th century and together with the Oakeley Quarry created the employment and wealth on which the town of Blaenau Ffestiniog grew.
- ii Whilst the town's economy has since diversified into tourism and other industries, it is the working of slate which remains the dominant factor in the town's history, economic well-being, culture and environment.

### Planning permissions

- iii The Llechwedd Slate Mines Complex operates under four main planning permissions and this written statement is submitted in accordance with the requirements of the terms of those permissions. The relevant application numbers are 1108/9/5 (dated 30/09/50), 1109/9/6 (dated 10/11/51), FFES.U/20 (dated 01/03/53), and 5/14/521 (dated /10/97).

### Planning conditions

- iv The latter of the above permissions is conditional on the operator preparing and submitting for the approval of the local planning authority regular formal reviews of all mineral working and ancillary operations which are being undertaken at the site under the terms of that planning permission.
- v The permission requires that each review shall be in the form of a five year operational programme to be set out in a written statement and accompanied by appropriate plans, specifications and technical data together with any other information reasonably required by the local planning authority. This written statement is submitted to comply with the above requirement.
- vi Application is being made under the Environment Act 1995 proposing the modification of the three other older permissions to include a similar range of environmental conditions as those attached to application number 5/14/52. These include a requirement to submit an operational programme. This written statement is therefore submitted to cover the whole operational area of the Llechwedd Slate Mine Complex.
- vii As this is the first such submission it is produced in two parts. Part one is the actual operational programme for the next five years and part two is the overall landscape strategy within which the five year plan has been produced.



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## **Part 1 - The Five Year Operational Programme**

*Areas of activity*

*Underground workings*

*Surface workings*

*Surface tipping of mineral waste*

*Landscaping*

*Surface water drainage and treatment*

*Dust suppression*

*Footpaths*

*Archaeology*

*Wildlife habitats*



## Part 1 - The five year operational programme

### 1 Areas of activity

- 1.1 In accordance with the terms of the four planning permissions the programme defines the areas where operations have taken place since the grant of planning permission and sets out the Company's intended operational activities over the next five years. Each of these requirements is subdivided into the following areas of activity :
- the areas where the underground working of slate has taken place and the areas where it is proposed to continue underground working over the next five years,
  - the areas where surface working has taken place and the areas where it is proposed to continue the surface working of slate over the next five years,
  - the areas where the surface tipping of mineral waste has taken place and the areas where it is proposed to tip mineral waste over the next five years, and
  - the areas where landscaping or other ameliorative works have been carried out and the areas where it is proposed to carry out such works over the next five years.
- 1.2 The remainder of Part 1 of this statement deals with each of the above activities in more detail. Where necessary each activity is sub-divided on a geographic basis.

### 2 Underground Workings

- 2.1 The two permitted areas of underground working are very extensive. The one area lies to the east of the A470 and measures approximately 1 km from east to west and just under 2 km from north to south. The second area extends from the old Votty and Bowydd mine in the west for nearly 2.5 km to the ridge-line between Cwm Bowydd and Cwm Penmachno in the east. The area measures 1.2 km from north to south. The extent of the two permitted underground working areas, which total 347.8 hectares, are shown edged red on the accompanying plan LLECH.97.02.

#### *Existing underground workings*

- 2.2 Records indicate that whilst the deposit areas around the individual company operations were extensively mined over the last 150 years, with an estimated 25 miles of tunnels in the Llechwedd Section alone, there remain substantial areas which have not yet been worked.
- 2.3 The areas shaded with red dots on plan LLECH.97.02 indicate the current extent of underground workings within the complex. What this plan does not show is that there are up to twenty working levels underground in the four former mines and much of any future working will take place without extending the operational area.

2.4 The following table indicates the approximate underground floor level in each mine :

| Llechwedd |      |        | Votty and Bowydd |      |        | Maenofferen |      |        | Diphwys Casson |      |        |
|-----------|------|--------|------------------|------|--------|-------------|------|--------|----------------|------|--------|
| Level     | Feet | Metres | Level            | Feet | Metres | Level       | Feet | Metres | Level          | Feet | Metres |
|           |      |        |                  |      |        |             |      |        | 6              | 1407 | 429    |
|           |      |        |                  |      |        |             |      |        | 5              | 1316 | 401    |
|           |      |        |                  |      |        |             |      |        | 4              | 1246 | 380    |
|           |      |        |                  |      |        | A           | 1163 | 355    | 3              | 1181 | 360    |
| 7         | 1099 | 335    |                  |      |        | B           | 1069 | 326    |                |      |        |
| 6         | 1039 | 317    |                  |      |        | C           | 1012 | 309    |                |      |        |
| 5         | 997  | 304    |                  |      |        | D           | 983  | 300    |                |      |        |
| 4         | 955  | 291    |                  |      |        |             |      |        |                |      |        |
| 3         | 908  | 277    |                  |      |        | E           | 880  | 268    |                |      |        |
| 2         | 868  | 265    |                  |      |        |             |      |        |                |      |        |
| 1         | 814  | 248    |                  |      |        | F           | 824  | 251    |                |      |        |
| A         | 766  | 234    |                  |      |        | G           | 767  | 234    |                |      |        |
| B         | 692  | 211    | F                | 709  | 219    | H           | 709  | 219    |                |      |        |
| C         | 641  | 196    | G                | 654  | 199    | I           | 642  | 196    |                |      |        |
| D         | 573  | 175    | H                | 601  | 183    |             |      |        |                |      |        |
| E         | 520  | 159    | I                | 542  | 165    |             |      |        |                |      |        |
| F         | 471  | 144    | K                | 481  | 147    |             |      |        |                |      |        |
| G         | 414  | 126    | L                | na   | na     |             |      |        |                |      |        |
| H         | na   | na     |                  |      |        |             |      |        |                |      |        |
| I         | na   | na     |                  |      |        |             |      |        |                |      |        |

notes : (i) The levels for Diphwys Casson have been estimated from surface levels at mine entrance points as no cross sections exist for the mine.

(ii) All levels are selected points within the underground working area. The natural drainage system means that other parts of the same level are either slightly higher or lower than the figures given.

(iii) na indicates that levels are not available.

2.5 Records also show that areas of existing underground working at the former Llechwedd and Diphwys Casson mines were inadvertently omitted from the plans attached to the permissions issued by the Minister on the 1st March 1953 and the 30th September 1950. The areas shaded with red dots which are outside the red edge on plan LLECH.97.02 identifies these areas.

#### *Proposed underground working*

2.6 Even within the worked underground areas there remain substantial deposits of slate in the form of pillars which give support to the overlying ground. Whilst surface working aimed at recovering these deposits has become an increasingly important aspect of the Company's operation in recent years the continuation of underground working is an essential part of the Company's future strategy and a team of miners is maintained specifically for this purpose. The focus of current underground working is in Levels A, B and F of the Maenofferen mine and this will continue to be the area of working over the next five years.

### **3 Surface Workings**

- 3.1 At present there are six separate surface working areas and under the terms of the planning permission it is proposed to rationalise these into two. These are referred to as the Llechwedd and the Maenofferen Sections.

#### ***Llechwedd Section***

##### *Permitted surface working area*

- 3.2 Permission has been granted to rationalise the three existing surface working areas into a single surface working area. The total area permitted is defined by a purple edge on plan LLECH.97.03.

##### *Existing surface working areas*

- 3.3 The three separate surface working areas at present within the Llechwedd Section are shown on the plan by two shades of purple, the lighter shade for the quarry floors and the darker shade for the working faces. The areas shaded with purple dots indicate the current operational areas. The most important development in operational terms over the last two years has been the establishment of benches. These benches will ensure safety as the height of the working faces increase and improve access to areas of future working.

##### *Proposed surface working areas*

- 3.4 Over the next five years it is proposed to develop and enlarge each of the three existing working areas into the areas hatched purple on the same plan. A key objective over that period will be to further develop a series of benches to provide safe access to the remainder of the deposit and enable access to be gained to the deeper deposits..

#### ***Maenofferen Section***

##### *Permitted surface working area*

- 3.5 The total permitted area of surface working is defined by a purple verge on plan LLECH.97.04.

##### *Existing surface working areas*

- 3.6 The planning permission envisages the eventual linking of the three existing surface working areas associated with the Maenofferen, Votty and Bowydd and Diphwys Casson operations. The areas where surface working has so far taken place are defined on the plan by the two tones of purple shading.

##### *Proposed surface working areas*

- 3.7 In the next five years surface working is to be confined to the area immediately surrounding the former Maenofferen working area. This is hatched purple on the same plan. To facilitate access to the working area and carry materials away it is

proposed to construct three new access roads. The position of these is shown on plan LLECH.97.04.

#### **4 Surface tipping of mineral waste**

- 4.1 Tipping space is required for approximately 200,000 cu m of waste material generated annually from the clearance of overburden and slate production. Although there are extensive areas where the surface tipping of mineral waste is permitted, tipping has already been completed in some of these areas, whilst tipping in other areas has not yet started or is yet to be completed.

##### ***Llechwedd Section***

###### ***Permitted tipping areas***

- 4.2 The areas permitted for tipping are shown by a blue verge on plans LLECH.97.05 and LLECH.97.06. The areas where tipping has largely been completed are shown shaded in blue.

###### ***Current working tips***

- 4.3 The principal current active tipping area, Tip F on plan LLECH.97.08 (see Part 2- Landscape Strategy), lying to the south of Floor 7 Mill is defined by blue dot shading on plan LLECH.97.06. Over the next two to three years it is proposed to increase the height of this tip by some fifteen to twenty five metres, and thereafter, to commence tipping in the area lying to the east of the current compound area, the area hatched blue on the plan. In addition, back-fill tipping will continue within the three surface working areas shaded with blue dots on the plan providing this does not interfere with other surface working operations.

##### ***Proposed new tipping areas***

###### ***Ffridd-y-Blaen Tip***

- 4.4 The Ffridd-y-Blaen tipping area, Tip B, is situated to the north of the Llechwedd Section between Afon Barlwyd and the existing access road leading to Llynnau Barlwyd and is shown hatched blue on plan LLECH.97.06. It is proposed to commence the first phase of tipping operations in 1999. The tip will have a life of approximately five years.

###### ***Maenofferen Powerhouse Tip***

- 4.5 Unless the quantities of waste material generated by the development of the Llechwedd Section exceed forecasts tipping is unlikely to commence on this permitted tipping area, Tip C, before the end of the fifth year of the programme. If tipping is required on this area it will be undertaken in three phases, the first phase of which is shown hatched blue on plan LLECH.97.06.

### ***Maenofferen Section***

#### ***Permitted tipping areas***

- 4.6 The areas permitted for tipping are shown by a blue verge on plan LLECH.97.07 and the areas where tipping operations have been completed are shown shaded blue.

#### ***Current working tips***

- 4.7 There are currently two active tips, Tips Q and X, which are defined by blue dot shading on plan LLECH.97.07. Tip Q, the Maenofferen Mill tip is now effectively completed. Although Tip X will remain active its use involves too great a carry to serve the needs of the proposed surface working area.

#### ***Proposed new tipping areas***

##### ***Maenofferen Mill Tip Extension***

- 4.8 It is proposed over the next five years to construct the first phase of Tip P by extending the existing Maenofferen Mill Tip, Tip Q. The area of proposed tipping is shown by blue hatching on plan LLECH.97.07.

## **5 Landscaping**

#### ***Areas to be stripped over next five years***

##### ***Llechwedd section***

- 5.1 The area hatched purple on plan LLECH.97.03, part of Area A referred to in the landscape strategy, will be progressively stripped in advance of excavations. This is expected to yield 3,200 cu m of topsoil during this five year period. The material arising will be used in the restoration of Area G and the first phase of restoration of Area F.
- 5.2 The area of land shown hatched blue on plan LLECH.07.05 proposed for the development of the Ffridd-y-Blaen tip, Area B in the landscape strategy, will be stripped of topsoil in 1999 after the construction of new drainage channels. The material arising, 7,400 cu m, will be used in part for the second phase of restoration work on Area F, and the remainder, will be spread and stored in Area I for future use in the restoration of Area B.
- 5.3 The topsoil on the first third of Area C, the Maenofferen Powerhouse tip shown hatched blue on plan LLECH.97.05, will be stripped at the end of the five year period if additional tipping capacity is required. The quantity arising will be about 3,900 cu m and this will be stored on Area I until needed to cover parts of the new tip as it is formed.
- 5.4 The land adjacent to the existing compound, the area hatched blue on plan LLECH.97.06 and Area E in the landscape strategy, will also be stripped towards the end of the five year period, about 2001. The quantity arising will be about 4,700 cu

m. It will be stored on the western part of area E and reused to cover tip E as it is built and some on tip D when tip E is nearing completion.

### *Maenofferen section*

- 5.5 The extension to the Maenofferen Mill tip shown hatched blue on plan LLECH.97.07, the first section of Area M in the landscape strategy, will be stripped towards the end of the five year period. Material will be used to restore the first phase of Tip P and the area of the existing Maenofferen Mill tip, Tip Q, which faces towards the town.

### *Movement of materials*

- 5.6 The following tables indicate the source and movement of materials over the next five years. The letter codes refer to the geographic areas described in the landscape strategy shown on plan LLECH.97.08.

### *Summary of Five Year Operational Movement of Materials*

| Waste tip capacity cu m over 5 years |         | Topsoil arising from stripping-cu m |       |
|--------------------------------------|---------|-------------------------------------|-------|
| F                                    | 220,000 | A                                   | 3,200 |
| B                                    | 400,000 | B                                   | 7,400 |
| E                                    | 80,000  | C                                   | 3,900 |
| P                                    | 145,000 | E                                   | 4,700 |
| A                                    | 310,000 | M                                   | 1,000 |
|                                      |         | Store J                             | 3,400 |

### *Proposed movement of materials over the five year operational plan*

| Excavation |       |         | Tipping |         | Soil stripped |       | Soil spread |       |
|------------|-------|---------|---------|---------|---------------|-------|-------------|-------|
| Year       | Area  | Vol     | Area    | Vol     | Area          | Vol   | Area        | Vol   |
| 1998       | A     | 210,000 | F       | 160,000 | Store J       | 1,800 | G           | 2,500 |
|            |       |         | A       | 50,000  | A             | 3,200 | F           | 2,500 |
|            | M (u) | 5,000   | P       | 5,000   |               |       |             |       |
| 1999       | A     | 200,000 | F       | 60,000  | Store J       | 1,600 | F           | 2,500 |
|            |       |         | B       | 90,000  | B             | 7,400 | Store I     | 6,500 |
|            |       |         | A       | 50,000  |               |       |             |       |
|            | M (u) | 5,000   | P       | 5,000   |               |       |             |       |
| 2000       | A     | 200,000 | B       | 150,000 | Store I       | 2,500 | F           | 2,500 |
|            |       |         | A       | 50,000  |               |       |             |       |
|            | M (u) | 5,000   | P       | 5,000   |               |       |             |       |
| 2001       | A     | 200,000 | B       | 80,000  | Store I       | 2,000 | B           | 2,000 |
|            |       |         | E       | 40,000  | E             | 4,700 | Store E     | 4,700 |
|            | M (u) | 5,000   | A       | 80,000  | M             | 1,000 | P           | 500   |
|            | M     | 40,000  | P       | 45,000  |               |       | Q           | 500   |
| 2002       | A     | 200,000 | B       | 80,000  | C             | 3,900 | Store I     | 3,900 |
|            |       |         | E       | 40,000  | Store I       | 2,000 | B           | 2,000 |
|            | M (u) | 5,000   | A       | 80,000  |               |       |             |       |
|            | M     | 80,000  | P       | 85,000  |               |       |             |       |

### *Priority areas for landscape restoration*

#### *Llechwedd section*

- 5.6 There are three main areas that can be usefully treated in this period. In priority order these are operational Areas G, F and B defined on Plan LLECH.97.08.
- 5.7 Area G, the first of these areas, is situated on the old inactive tip in the south west corner of the site facing the A470 and the residential area. There are several former access roads and associated level areas here and also a few gently sloping banks which are suitable to start the restoration processes. The area will be used to determine the best methods and materials for the site as a whole. Planting here will include heather, bramble, birch, rowan and scrub willow. The areas to be treated are defined by green shading on plan LLECH.97.09.
- 5.8 Area F is an active tip, the south west and western faces of which can be seen from parts of the town, and the A 470 as it passes the site. These faces of the tip are therefore the most important for restoration. The western face can be partially treated now as there are some suitable levels on the lower slopes adjoining Area G. As the tip nears completion the shape of the top will be formed to remove the table top appearance that machine formation can leave. A more sympathetic finish will be engineered to blend this large tip in with the background as seen from the lower levels from where it will be seen as a skyline feature.
- 5.9 Planting on these slopes will be aimed at establishing a mixture of moorland grasses, heather, rushes and occasional groups of trees to give a patchy cover of appropriate colour and texture which will fit in with the surrounding landscape. The areas to be planted immediately and as the tip develops are shown, together with the finished profile of the tip, on plan LLECH.97.09. The eastern face of the tip will be left untreated as it will be covered when tipping extends into Area E.
- 5.10 Area B is the third area proposed for treatment in the first five year programme. Following land drainage works, the area will have its top soil removed in 1999 in preparation for tipping to commence in the spring of the following year. The tipping here will be fairly rapid and the tip should be completed by the end of the five year period. The surrounding land form and plant communities have been studied and the finish of the tip will be sympathetic to the shape and texture of its setting. The areas to be treated and the finished profiles of the tip are shown on plan LLECH.97.10.
- 5.11 The valley in which tip B sits is an open gently sloping form, well covered with rushes and grass. The restored slopes of tip B will reflect this where possible, but it is inevitable that the tip will be better drained than the valley floor. This will tend to favour grasses at the expense of rushes and heather, giving a lighter smoother appearance to the finished form. It will therefore have a slightly different appearance than the higher parts of the valley. However it is large enough to fit in the valley as a feature in its own right, especially when seen in association with area C which will have a similar appearance.

*Maenofferen section*

- 5.12 Area Q is the current working tip which meets the small scale needs of underground workings at Maenofferen. This tip has now reached its capacity and work is commencing immediately on its extension into Area P where tipping will continue at a slow pace until surface working re-commences towards the end of the five year period. Area P has very little topsoil and is very steeply sloping which makes topsoil stripping impractical. In view of this it is proposed to delay a commencement of restoration in this section until 2001 when the first phase of Area M is due to start.
- 5.13 As topsoil becomes available from Area M restoration of Area Q and the first phase of Area P will commence. The style of reclamation will follow the same pattern as Area G, that is with limited patches of topsoil placed on the slopes of the tip facing towards the town. Planting here will include heather, bramble, birch, rowan and scrub willow. These are the only areas in the Maenofferen section that will be restored in the five year programme. Proposals for restoration of Areas P and Q are shown on plan LLECH.97.11.

**6 Surface water drainage and treatment**

- 6.1 The proposed arrangements for the handling of surface water drainage and treatment over the next five years are set down in the following paragraphs.

*Llechwedd Section*

- 6.2 Within the existing operational areas water drains through the former underground workings down to Level C which acts as a settling lagoon for any fines washed down during periods of rainfall. As the new surface area operation develops it will be important to prevent rainwater falling outside the working area on the higher ground to the north and east from entering the operational area. To this end a cut-off channel will be constructed to the north and east of the workings as indicated on plan LLECH.97.10.
- 6.3 The treatment and recirculation of water used in the processing of slate in the Floor 7 Mill will continue in the settling tanks recently constructed for that purpose.

*Ffridd-y-Blaen Tip*

- 6.4 Before works commence on Ffridd-y-Blaen tip, Area B, a cut-off channel will be constructed to the east of the tip in the position indicated on plan LLECH.97.10. The channel will run parallel to and above the access road leading to Llynnau Barlwyd. The purpose of this channel is to prevent surface water finding it's way on to the tipped area and picking up fines from the tip. The water collected will be discharged into Afon Barlwyd.
- 6.5 Rainwater falling into the tipped area will be collected by two channels. These channels will be created below the toe of the proposed tip parallel to, and approximately 10 metres from, the Afon Barlwyd and alongside the western edge of

the tipping area. Water collected in these channels will be taken along the southern edge of the tipping area and thereafter flow by means of a further channel into the Llechwedd Section surface working area. From that point it will be piped or channelled to the Level C settling lagoon. The position of the collection channels are shown on plan LLECH.97.10.

### ***Maenofferen Section***

- 6.6 All rainwater falling within the surface working area will be drained into collection channels and from there into existing underground chambers which will be used as settling lagoons.
- 6.7 Although the majority of water falling outside the operational area is already channelled away from the site there is one watercourse, just to the north of Maenofferen Mill, where this does not occur. It is proposed in the five year plan to reduce volumes in this water course through the improvement of water management in the catchment area as a whole. This is part of an intention to further develop the potential for hydro-generation within the complex for which separate proposals will be submitted in due course. The reduced volume in the watercourse will be diverted into a new channel, to be constructed to the north of the Rhiw Bach Tramway, to carry water away from the operational area. This is shown on plan LLECH.97.11.

## **7 Dust suppression**

- 7.1 The movement of vehicles over unsurfaced roads is the major cause of dust within the operational areas. It would be uneconomic to surface all these access roads, which are shown coloured grey on the submitted plans, and it is therefore proposed to suppress dust by the use of a water bowser. The vehicle will be used to spray water on all operational roads during periods of dry weather. The frequency of spraying will be sufficient to ensure that the amenity of local residents are not adversely affected. Roadways which are not in use will not be sprayed unless they are specifically seen to be causing a problem.
- 7.2 It is not considered that other operations, such as surface working and tipping, which take place well away from residential property will cause dust problems. Furthermore, the prevailing south-westerly winds carry any small quantities generated by these operations away from such property.

## **8 Footpaths**

- 8.1 The Company have made a declaration of existing rights of way having given notice under Section 31(6) of the Highways Act 1980. A number of those existing footpaths are affected by proposals for which planning permission has been granted. It is the Company's policy to ensure that where footpaths are adversely affected suitable alternatives are put forward which will maintain, and where possible enhance, the network.

- 8.2 The only footpaths affected in the five year plan are sections of Footpath No 101, affected by the proposed Ffridd-y-Blaen tip, and Footpath No 103 which is affected by the same tipping operation and the first phase of the Maenofferen Powerhouse tip. The minor diversions of Footpath 101 indicated on plan LLECH.97.10 should provide an alternative route which is acceptable to all interests. The diversion of Footpath 103, which is also affected by future surface working, requires consultation and discussion with interested parties before a suitable alternative can be proposed. These discussions will be commenced early in the programme and the consequence of the consultation process notified in due course.

## 9 Archaeology

- 9.1 A written scheme of investigation is being undertaken as part of the five year operational plan. An archaeological assessment was prepared in 1991 in respect of Ffridd-y-Blaen tip and the Llechwedd surface working area and is attached as *Appendix 1a*. An archaeological assessment has recently been prepared for the other areas of land affected in the five year plan and is attached as *Appendix 1b*. The Company will give at least 14 days notice to the Local Planning Authority before any soil stripping operations are commenced in any of the operational areas.

## 10 Wildlife habitats

- 10.1 The Company have recognised the importance of habitats for protected species. Although none of the proposals in the five year plan directly affect these interests they will continue to facilitate access for those nominated by the authority to look after those interests.

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## **Part 2 - Overall Landscape Strategy**

*Introduction*

*Key factors influencing the landscape strategy*

*Types of treatment and methodology*

*Establishing appropriate vegetation*

*Operational areas*

*The production and movement of materials*



## Part 2 - Overall landscape strategy

### 11 Introduction

- 11.1 Slate workings are not operations which can be easily hidden or disguised through landscape design. However, careful planning at the design stage, together with improving techniques for restoration, can significantly reduce environmental impact or damage. It is a key objective of this strategy that all practical steps be taken to minimise visual impact on the surrounding area. The following paragraphs outline the main areas where landscape treatments is proposed.

#### *Surface working areas*

- 11.2 The three present surface working areas in the Llechwedd Section are not visible from the town and can only be seen from the higher ground to the north and from the site entrance off the A 470. The approved rationalisation of these three areas into a single operation and the reduction in the land area taken up by their attendant roadways, tips and other surface activities will reduce the overall visual impact of surface operations.
- 11.3 The extension of the surface working area to the north will not be seen from either direction as it is screened from view by the natural contours of adjoining land. Accordingly, no specific landscape treatment is considered necessary to screen the surface working areas during the time that they are operational except landscaping works that may be required in consequence of the proposed A 470 improvement. What is addressed in the strategy is the long term treatment of the rock faces, benches and the floor of the working area together with any tipping that has taken place thereon.
- 11.4 Surface working at the western end of the Maenofferen section will in the long term remove existing areas of dereliction and will, therefore, reduce the overall visual impact of the workings on the town. The eastern end of the surface workings will not be seen from the town. They will, however, be visible from the mountain areas to the north and east although their impact will be minimal set against the general backcloth of the existing workings and the distances over which they are viewed. No mitigating landscape treatment is, therefore, considered necessary at the operational stage. It should be noted that with the exception of the eastern end of the Maenofferen workings there is virtually no soil available due to previous activity.

#### *Tipping areas*

- 11.5 The main opportunity for landscape restoration in both the Llechwedd and Maenofferen sections lies in the treatment of the tipping areas. As the success of such works is largely dependent on the availability of topsoil every opportunity will be taken at the development stage of both surface working and tipping areas to strip all top soil and sub-soil suitable for landscape treatment. Whenever practicable the material will be directly used for positive landscape treatment and this is dealt with in detail later in this statement.

- 11.6 Where this is not possible, storage areas have been identified within the permitted planning unit to ensure that topsoil is safeguarded for later use. It should, however, be recognised that any topsoil is extremely thin in such elevated and rocky areas and the quantities that will be available are relatively small.

## 12 Key factors influencing the preparation of the landscape strategy

- 12.1 In preparing a Landscape Strategy for the operational area of the Llechwedd Mines covered by the four planning permissions the following eight points were considered as the key factors :

- *that the majority of the operational area is situated in an exposed upland location heavily grazed by sheep with a high rainfall.* This has given rise to a characteristic landscape best described as wet upland moorland. It is typified by poor open pasture dominated by fine fescue grasses, heather, rushes and associated acid moorland plants with occasional trees.
- *that a small area of lower land running alongside the A470 has good tree cover.* A very important function of the tree cover is the screening which it provides for the mineral operations when viewed from the road and some of the residential areas. As part of this area is likely to be affected by the improvements proposed for the A470 it is important to safeguard this strip as much as possible and add to the tree cover where necessary to strengthen its effect. The landscaping proposals for this lower area are of course completely different to the more extensive quarried and tipped areas on the higher ground.
- *that the restoration process should try to establish a plant community similar to or compatible with those found in the surrounding landscape.* This will presume an element of grazing by sheep.
- *that mining and quarrying have been extensively carried out in the area leaving a legacy of large tips many of which are ancient and will remain, more or less, as they now are for centuries.* Indeed there are some slate tips within the operational area that will remain recognisable as slate tips even after final restoration has been completed.
- *that the plan for the final restoration of the area must take into account that this is a working mineral operation of which parts will remain active for many years.* Some restoration will not, therefore, be possible until operations have been completed.
- *that slate tips have to be free draining if they are to be left at or near their natural angle of repose.* In establishing vegetation on steep sided tips it will not be possible to cover the surface completely with soil and vegetation. Allowance must be made for the free passage of water through the sides of the tip in the interests of stability. Some tips can be graded out which will allow better plant cover to be achieved.

- *that with modern machines debris can be moved and treated to form acceptable shapes with surfaces able to support some appropriate vegetation.* However, even after reinstatement, some areas will always show signs of past working as the natural moorland vegetation reveals land form extremely well. Where old tips have to be left in their present form areas suitable for the establishment of plant cover will be selected. Plants such as heather and pioneering species of trees will be encouraged to spread from former benches and gently sloping areas.
- *that the quantity of topsoil available for restoration purposes is small and its quality poor.* The failure of former operations to differentiate between topsoil and waste slate has resulted in the loss of valuable topsoil material. Whilst new areas are being separately stripped to preserve the limited topsoil that is available they do not contain enough material for complete cover on reinstatement. This is due to the fact that there is only a very shallow depth of useful material in the areas to be stripped and its storage and re-spreading will inevitably lead to losses. Conservation of what exists and its use in areas that will secure the greatest benefit is therefore important.

### *Definitions*

- 12.2 The following definitions are given to clarify the basis on which this written statement has been prepared.

*Topsoil* refers to the top layer of material which contains some vegetable matter, mostly peat and plant debris, together with thin layers of sand and clay. It is highly acidic and has an average depth of only 150 mm.

*Overburden* refers to the mixed rock and slate debris, including past material generated by slate processing, which overlays and has to be removed from the proposed surface working areas in order to get access to useful slate.

## **13 Types of treatment and methodology**

### *Stripping and storage of soils, peat and other top layers*

- 13.1 In this upland area the top layer supporting vegetation is mostly a mixture of thin acidic soil, peat, sand and clay, including some undecayed vegetable matter. When stripped it is impossible to separate the vegetable matter, living or dead, from the pure soil. The material therefore could more correctly be described as "peat and plant debris," and as such the problems of storage, particularly long term, are different from those encountered with normal lowland topsoil.
- 13.2 The shorter the storage period for any topsoil the better. The material collected from this site, if it is to be kept for longer than six months, should not be stored at a depth greater than 750 mm. A shorter period of three months would be more desirable, but realistically, working plans will have to be kept flexible.

- 13.3 When stored in bulk there is the possibility that this peaty material will have the loose particles washed out of it in this high rainfall site. Normal topsoil would settle and vegetable matter in it would compost. This is not likely to happen here as the high acid content will preclude micro-bacterial activity and the vegetable matter will act as a draining mat allowing the passage of fine materials including some peat particles.
- 13.4 The stripped material will be taken from the top 150 mm layer and then spread on other areas nearby. The advantage of this method is that it keeps losses to the minimum by trapping any washed out particles in the vegetable layers underneath. Also when the second stripping operation takes place the machines will find it easier to collect the deeper layer of material with minimum contamination from subsoil.
- 13.5 In some areas there will be insufficient topsoil to give adequate depth for the successful establishment of plant cover. In fact the inevitable losses associated with stripping, storing and re-spreading topsoil together with the necessity of spreading to a minimum depth of 300mm., as seen against an average stripping depth of 150mm., will mean a considerable shortfall.
- 13.6 There is no suitable source of material outside the site and we would not want to rob another area or risk importing inappropriate material which would give a different appearance to plant cover. There are some limited areas of lower land near the A470 which might accept some imported topsoil, but this is a very limited part and the soil required here bears no comparison with that found on the higher moorland areas.

### *Surface working areas*

- 13.7 All the surface working areas require large spaces for the machines to manoeuvre and materials to be collected, stored and loaded. It will therefore be some time before restoration can usefully take place in these excavated sections. As work proceeds space will become available for limited tipping behind the working areas. This tipping will establish a platform in the bowl of the pit which will be suitable for the establishment of plants. The surface will be well consolidated by machines as they build up the tips in layers creating a lot of fine material in the process. Drainage in these tips is not essential as it is in free standing tips as there will be no chance of tip movement. However it is essential to maintain some means for the water to escape or ponds will form in the lower sections.
- 13.8 In these sheltered holes with their fines rich surface, plentiful water supply and limited access for sheep the conditions for plants to grow are very much better than on exposed well drained tips. This is evidenced by plant growth in many former quarry pits, both on this site and elsewhere. It is therefore intended to take advantage of these conditions to establish plant cover as soon as possible following extraction and tipping operations. There will be considerable quantities of dust whilst operations continue on nearby benches and this will limit the choice of species to those able to tolerate these conditions. There is every confidence that these areas will support plant cover and the pattern of planting will be that of open woodland. In areas where sheep are completely excluded closed tree cover will be established.

- 13.9 On benches established on the working faces there are opportunities for establishing modest planting areas. These are useful areas as they are often protected from sheep and have some shelter. They also form a very important function in providing litter and seed which fall onto lower areas and crevices in the faces forming compost and spreading patches of vegetation.
- 13.10 The finish proposed on the benches is little more than spreading patches of fines and soil mix to allow plants to establish. Pioneer species only will be used, rowan, birch and goat willow, and the minimum of nutrient provided in order to encourage slow but secure long lasting growth.

### *Proposed tipping areas*

- 13.11 New tips will be finished with a fines rich surface which will fill voids in the top layers and allow topsoil to be spread over the surface. This will create the conditions for the appropriate vegetation to establish where necessary. There will not be enough topsoil to treat all areas and in some places where plant cover is wanted different techniques will be employed using little or no topsoil. Fine crushed slate will be used to seal the tip surface, allowing for drainage on slopes, and provide a source of moisture and some nutrients. Graded crushed slate will be mixed with other materials such as composted bark, processed waste paper residue, moisture retaining polymers and other organic materials to produce a compost that will support plants until they establish on the tips beneath.
- 13.12 The fine material is generated by crushing the slate with the machines that spread it as they form the tip using tracked machines and special rollers. There are other sources of fine crushed material available from the various finishing processes currently undertaken in the mills as well as pockets of natural material found in overburden during excavation. These materials will be selected and placed on tips as they are formed thereby creating a suitable surface on which to place the topsoil. The material will not be placed on steep slopes where it would be likely to impede drainage and lead to instability.
- 13.13 When stripped soil is re-spread over prepared tip surfaces it will contain considerable quantities of vegetable matter. This is beneficial as it contains the dormant seeds and living plant material from the local area that can re-establish on the disturbed ground. The material is however difficult to spread as it contains mats of roots and plant material. The practical depth to aim for in re-spreading is 300 mm. on level ground, and 450 mm. on steep slopes. These depths are necessary to prevent fine materials washing through to voids below, and to withstand some losses through the inevitable drying effects of the wind, and possibly frost, before it re-establishes. Attempts to spread this soil and plant mixture in thin layers will not be successful without laborious hand selecting and placing of individual sods which is not practical on the banks of large tips.

### ***Existing tipping areas***

- 13.14 Slate tips have a natural angle of repose of about 45° and depend on free draining characteristics to maintain their stability. Whilst it is acceptable to establish pockets of plant growth on tips it is not safe to completely cover them over with vegetation without reducing the steepness of the slopes by reshaping the whole structure. The sides of tips are of more concern than the tops as there is the possibility of an area of soil and vegetation becoming waterlogged and sliding off down a steep side. The extra weight of extensive soil and vegetation cover must also be taken into account. There are duties of care imposed on site owners that require regular inspections of both active and dormant tips, and any proposals to reshape or to establish plant cover on them will have to be approved by the engineers. Should a conflict arise, safety considerations will prevail.
- 13.15 Old tips often have an element of fines left on the surface particularly on level sections, but extra material may be needed to seal the voids in some locations before successful planting can take place. In general the larger topsoiled areas will be more successful as such areas are better able to retain moisture and they are less likely to suffer from reflected heat from surrounding slate. Groups of plants also benefit from each others protection against exposure to drying winds. For these reasons strips of former haul roads and railtrack runs will be selected. If these level areas have banks above them the lower slopes of those banks will also be treated.
- 13.16 Planting on the top slopes of well drained banks is seldom successful as drought conditions are usually experienced. Plant failure on slate tips is often due to lack of water even in these high rainfall areas, with lack of available moisture becoming a problem even after very short dry periods. Restoration at Llechwedd will therefore concentrate on those areas most likely to be successful.

## **14 Establishing appropriate vegetation**

- 14.1 The establishment of some trees and other shrub species on tipped areas is certainly possible but special techniques are needed. Trees grown on the higher levels, particularly on the tops of banks, have a special contribution to make as they distribute leaf debris and seed which is caught in voids lower down the slopes. This speeds up the colonisation process on the banks and eventually forms a suitable medium in which seeds can grow. Unfortunately it is the upper slopes of the tips that are the most difficult to get trees to grow in. Even pioneering species such as birch and rowan experience problems and they will need protection and moisture retaining composts.
- 14.2 It is considered that small groups of trees are acceptable on tips in this locality but wholesale planting is considered inappropriate in view of the open character of the surrounding countryside. Where small groups of trees are considered appropriate their location will be identified in the appropriate five year operational plan.

- 14.3 The exception to the above will be the area around the main entrance to the site and along the route of the A470 Trunk road where more intensive planting of trees is considered appropriate. Llechwedd will continue to liaise with the Welsh Office regarding their proposals for trunk road improvements to ensure that the current screening of the site is maintained and where possible enhanced.
- 14.4 New planting including trees, will use only species of locally found indigenous plants. These will be propagated from selected plants and seed gathered from the area. This will ensure that plants used are most likely to succeed and fit in with the surroundings. The soil over most of the site is so acidic that there is a danger of imported seed and plants either dying or remaining stunted. Trying to remedy this by lime application would only be a temporary measure likely to have adverse affect on surrounding plant communities, and has therefore been ruled out.
- 14.5 A special propagation unit will be set up within the quarry site which will produce a reliable and suitable supply of plants as well as offering the opportunity of employment and possibly training to suitable local people. Propagation of plants from local sources will be by seed and cuttings.

*List of plants to be used at Llechwedd*

- 14.6 It is proposed to use the following list of plants for restoration works on the upper areas of moorland, exposed mountainside and tips :

|                  |                     |                     |
|------------------|---------------------|---------------------|
| Silver birch     | Betula pendula      | Bedwen Arian        |
| Hairy birch      | Betula pubescens    | Bedwen Gyffredin    |
| Ash              | Fraxinus excelsior  | Onnen               |
| Hawthorn         | Crataegus monogyna  | Draenen Wen         |
| Bramble          | Rubus fruticosa     | Miaren              |
| Rowan            | Sorbus aucuparia    | Cerrinen            |
| Heather (Bell)   | Erica cinera        | Grug                |
| " (Cross leaved) | Erica tetralix      | Grug Croesddail     |
| Ling             | Calluna vulgaris    | Grug                |
| Goat Willow      | Salix caprea        | Helygen Grynndail   |
| Alder            | Alnus glutinosa     | Gwernen Lwyd        |
| Sessile oak      | Quercus petraea     | Derwen Ddail Digoes |
| Gorse            | Ulex europaeus      | Eithin              |
| Broom            | Cytisus scoparius   | Banhadlen           |
| Bilberry         | Vaccinium myrtillus | Llusen              |
| Foxglove         | Digitalis purpurea  | Bysedd y Cwn        |

- 14.7 In the restoration of the lower areas alongside the A470 and around the entrance complex it is proposed to utilise the following species :

|             |                    |                     |
|-------------|--------------------|---------------------|
| Alder       | Alnus glutinosa    | Gwernen Lwyd        |
| Ash         | Fraxinus excelsior | Onnen               |
| Aspen       | Populus tremula    | Poplysen Aethnen    |
| Sessile oak | Quercus petraea    | Derwen Ddail Digoes |
| Larch       | Larix decidua      | Llarwydden          |
| English yew | Taxus baccata      | Ywen                |
| Goat Willow | Salix caprea       | Helygen Grynndail   |
| Elder       | Sambucus nigra     | Ysgawen             |
| Dogwood     | Cornus sanguinea   | Cwyrwialen          |

|              |                     |                     |
|--------------|---------------------|---------------------|
| Hawthorn     | Crataegus monogyna  | Draenen Wen         |
| Holly        | Ilex aquifolium     | Celyn               |
| Blackthorn   | Prunus spinosa      | Draenen Ddu         |
| Dog rose     | Rosa canina         | Rhosen y Cwn        |
| Broom        | Cytisus scoparius   | Banhadlen           |
| Hazel        | Corylus avellana    | Collen              |
| Gean         | Prunus avium        | Cerirosen Ddu       |
| Rowan        | Sorbus aucuparia    | Cerrinen            |
| Scots pine   | Pinus sylvestris    | Pinwydden Albanaidd |
| Silver birch | Betula pendula      | Bedwen Arian        |
| Hairy birch  | Betula pubescens    | Bedwen Gyffredin    |
| Sycamore     | Acer pseudoplatanus | Sycamorwydden       |
| Heather      | Erica tetralix      | Grug                |
| Bramble      | Rubus fruticosus    | Miaren              |
| Foxglove     | Digitalis purpurea  | Bysedd y Cwn        |

- 14.8 All the above listed plants are found on site together with *Rhododendron ponticum* and Japanese Knotweed, referred to again in the next section, and the following :

|                  |                     |                 |
|------------------|---------------------|-----------------|
| Parsley fern     | Cryptogramma crispa |                 |
| Ivy              | Hedera helix        | Eiddew          |
| Stinging nettles | Urtica diocea       | Danadl Poethion |

### ***Plant control policies***

- 14.9 Both *Rhododendron ponticum* and *Reynoutria japonica* or Japanese knotweed are the subject of control programmes in the countryside and it is suggested that the following policies are adopted for this site.
- 14.10 *Rhododendron ponticum* is presently growing on several areas. These areas have been identified on a plan and their spread will be monitored to prevent invasion into new areas. There are two main areas of concern identified as a result of a preliminary survey, these are on the lower slopes of the tip facing the A470 trunk road and at the foot of the incline leading down from Maenofferen. In the case of the former the plants are causing no problem other than providing a seed source for further spread of the plants. In fact the present appearance of the plants on the lower slopes of the tip as seen from the A 470 is seen by many as an advantage as it "greens" an otherwise mostly barren tip face. However there is evidence that the spread of the plants is now becoming more rapid and will shortly become a real problem to the site by preventing the establishment of other acceptable plant species.
- 14.11 It is therefore recommended that plants are killed by poisoning as soon as other plants have been established on these slopes. This will be in three to four years time (2001-2002).
- 14.12 On the rising ground to the north-west of the incline to Maenofferen the rhododendron has established a closed canopy state and is supplying seed for the spread of the plants to adjoining areas. As this area is an approved new tipping site there is no advantages in keeping the plants in this area. It is proposed that the plants are cut to the ground and all stumps poisoned. This work would be best done in the spring of 1998 and the

debris from the cutting burnt on site one month later. A further visit to re-poison any surviving plants should take place in the late summer of 1998.

- 14.13 The presence of Japanese knotweed is limited to a few lower areas near the car parks and offices. The areas will be thoroughly surveyed and all outbreaks recorded on a plan. The plants will then be poisoned using an approved herbicide by a registered contractor in June 1998 with a follow up inspection and re-poisoning carried out in mid August 1998. The plant has the reputation of being awkward to eliminate and it will be necessary to monitor the sites for a further year and to repeat poisoning if necessary.

## 15 Operational areas

- 15.1 In order to define the treatment of each geographic area within the landscape strategy the Llechwedd and Maenofferen sections have been subdivided into operational areas. Each of these operational areas has been given a letter reference code which is indicated on plan LLECH.97.08. The surface area of each lettered block is set out below: All the figures contained in the remaining sections are best estimates based on all currently available information.

### *Llechwedd Section*

|        |              |                                |
|--------|--------------|--------------------------------|
| Area A | 289,500 sq m | Permitted surface working area |
| Area B | 49,300 sq m  | Approved tipping area          |
| Area C | 64,100 sq m  | Approved tipping area          |
| Area D | 28,900 sq m  | Approved tipping area          |
| Area E | 51,000 sq m  | Approved tipping area          |
| Area F | 116,200 sq m | Approved tipping area          |
| Area G | 122,300 sq m | Approved tipping area          |
| Area H | 478,900 sq m | Approved tipping area          |
| Area I | 67,200 sq m  | Proposed soil storage area     |
| Area J | 3,400 sq m   | Existing topsoil storage area  |

### *Maenofferen Section*

|        |              |                                |
|--------|--------------|--------------------------------|
| Area M | 454,200 sq m | Permitted surface working area |
| Area N | 57,700 sq m  | Approved tipping area          |
| Area O | 52,600 sq m  | Approved tipping area          |
| Area P | 42,600 sq m  | Approved tipping area          |
| Area Q | 20,900 sq m  | Approved tipping area          |
| Area R | 72,000 sq m  | Approved tipping area          |
| Area S | 59,000 sq m  | Approved tipping area          |
| Area T | 145,500 sq m | Approved tipping area          |
| Area U | 197,300 sq m | Approved tipping area          |
| Area V | 69,200 sq m  | Reclaimed tipping area         |
| Area W | 13,400 sq m  | Approved tipping area          |
| Area X | 50,000 sq m  | Approved tipping area          |
| Area Y | 54,400 sq m  | Approved tipping area          |

- 15.2 The total permitted surface working area referred to above is 743,700 sq m or 74 hectares. The total permitted tipping area is 1,745,000 sq m or 175 hectares.

## 16 The production and movement of materials including topsoil

- 16.1 The restricted availability of topsoil to undertake restoration work is a major concern which needs to be addressed. The following section of the statement considers the availability of top soil and overburden over the whole site and suggests how the materials can be used to greatest advantage.

### *Area A - Llechwedd Section*

- 16.2 Area A, 289,500 sq m, is the permitted surface working area of the *Llechwedd Section*. The majority of the surface of this area, 202,500 sq m, has already been stripped of topsoil. Most of the topsoil stripped historically has been lost although there is a small stockpile of about 3,400 cu m of material, stripped over the last year, which has been stored in fairly deep layers in a small disused quarry marked J on the plan. The method of storing topsoil like this is only suitable for periods of up to a year after which the material deteriorates. The topsoil currently stored in this area will therefore be used for landscape restoration purposes over the next few months.
- 16.3 Assuming an average topsoil depth of 150 mm it has been estimated that the remaining 87,000 sq m of Area A could produce a maximum of 13,000 cu m of topsoil. This together with the stockpile in Area J gives a total of 16,500 cu m. Approximately 6,600 cu m of this, will be available for restoration work immediately and the remainder in the following 10-15 year period. It is likely that all material immediately available will be required for restoration work by the end of 1998.
- 16.4 It is proposed that topsoil is stripped from Area A in advance of each five year programme of surface working and respread directly in the priority restoration areas identified in the operational plan to avoid storage problems and double handling. It is appreciated that in some areas this is going to be difficult but a substantial volume of the topsoil will be used in this way.
- 16.6 Area A will also produce a total of 5.7 million cu m of waste, including overburden, assuming an excavation depth of 65 m. Of this total some 1.01 million cu m of waste will be produced in the first five year programme for which tipping space will be required. This quantity will not have to be increased to allow for bulking when calculating tipping space required as the dig is through areas previously mined by the gallery method which leaves approximately 25% voids. The final volume of slate taken for production purposes that leaves the site is less than 1% of the excavated total.
- 16.7 As the excavation of Area A proceeds it will provide tipping room for some of the waste it produces. The quantities that will be tipped by this method over the first five years will be extremely limited.

*Area B - Ffridd y Blaen Tip*

- 16.8 A Phase 1 habitat survey has been undertaken for Area B and this is reproduced as **Appendix 2** to this statement. This indicates that no species of particular merit were recorded and that the basic vegetation which currently exists in this area is typical of upland Snowdonia and is well represented in the surrounding area.
- 16.9 In 1999 topsoil in Area B, amounting to approximately 7,400 cu m, will be stripped. 900 cu m will be used immediately for restoration in Area F and the remainder spread, in depths not exceeding 500 mm, alongside the existing access road on the north western edge of Area I.
- 16.10 Once topsoil stripping is completed in Area B, waste generated from Area A will be tipped in 10 m layers to the agreed profile leaving a 5 m bench at each level. This area will take 500,000 cu m of waste material and should be completed by the end of 2002. The finishing of the tip will ensure a surface reasonably covered in fines to prevent the topsoil simply washing through into the voids beneath.
- 16.11 The topsoil stored in Area I will then be progressively spread over the consolidated banks and benches of the tip as it is constructed. Depths of topsoil would be about 300 mm when spread as it is not practical to spread material thinner than this on these surfaces.
- 16.12 When the shape of the whole of tip B is satisfactory achieved, the remainder of the topsoil stored on Area I will be spread over parts of the banks and top layers to give the best effect as described in "methodology to be adopted."

*Area C - Maenofferen Powerhouse Tip*

- 16.13 Area C may be required for tipping towards the end of the current five year programme. The area will generate about 9,600 cu m of topsoil in total and should have the capacity to take approximately 920,400 cu m of waste material. It is proposed to develop the site in three phases starting at the southern end and proceeding northwards. Details of the proposed tip will be submitted with the first review of this plan.
- 16.14 The first phase will start with the removal of topsoil, approximately 3900 cu m, and its storage in a 500 mm layer on a 100 m by 80 m section of Area I immediately to the west.

*Area D - Completed tipping area*

- 16.15 This is a large tip recently finished with no vegetation yet established on it. The shape of the southern end is the natural angle of repose 45°, and the toe of the tip is right alongside the haul and access road to Maenofferen. There are no proposals to alter this tip at present but it will eventually be connected to the proposed tip E when it will be treated as one with the southern faces of both tips E and F as described in the next paragraph.

*Area E - Llechwedd Mill Tip*

- 16.16 It is proposed that Area E be developed for tipping linking together the completed tip on Area D and the current tipping Area F. At present a fenced storage compound occupies part of Area E and two haul roads separate the area from Areas D and F. The compound will be relocated to the site of the former Level 3 Mill and the haul road can be re-routed over the tipped area E. These roads have to be kept to provide a link to Maenofferen and provide an emergency route respectively.
- 16.17 Area E is very rocky and will yield not more than 4700 cu m of topsoil which should be used primarily on the southern face of the tip as it is formed. The volume of waste that can be tipped in area E has been estimated as 712,000 cu m. Since topsoil stripped from here will not be sufficient to treat the whole tip other methods will be used to establish plant growth. It is likely that this area will be stripped of topsoil in the fifth year of the plan with an anticipated start of tipping operations in the following year.

*Area F - Current tipping area*

- 16.18 Over the next five years approximately 7,500 cu m of waste material from Area A will be placed on and around the perimeters of Area F, the current active tip. Present proposals are to continue using this tip for at least 18 months, leaving a profile that rises to the south and avoids a flat table top finish. Although it is calculated that this area could take up to 20,000 cu m of topsoil to cover all of the finished tip surface it is not considered necessary to achieve a reasonable level of reclamation and vegetative growth. In terms of priorities the western and southern faces of Area F, which face towards the town and down the valley, are the more important for treatment with topsoil and they should be favoured. The remaining faces of this tipping area should have sufficient fines to enable a satisfactory level of reclamation to be achieved without the importation of topsoil.

*Area G - Completed tipping area*

- 16.19 It is proposed that 2,500 cu m of topsoil arising from Area A should be tipped to a depth of 450 mm on selected parts of area G. This unconsolidated tipping will form the basis of a trial area to establish re-instatement techniques. As this work is to begin immediately it is proposed to use the area as a trial for the re-establishment of moorland vegetation techniques.

*Area H*

- 16.20 This is an extensive area of untouched moorland for which tipping permission exists. There are currently no proposals to tip in this area unless all other tipping space in the Llechwedd section have been exhausted and/or the distance to alternative areas would be uneconomic.

*Area I*

- 16.21 This is a wet moorland area gently sloping to the north west but with few defined watercourses in contrast to the land to the north. The area is to be used for the

temporary storage of soil stripped from various areas including A, B and C. This soil will be deposited directly on the existing vegetation as described and explained in section 13.

#### *Area J*

- 16.22 Area J is a small former quarry which forms part of the Area A surface working area that will not be excavated for some time. It is currently in use as a temporary storage for topsoil arising from area A. The material stored here will now be used on areas G and F together with soil now arising from area E.

#### *Area M - Maenofferen Section*

- 16.23 Area M, 454,200 sq m, is the permitted surface working area of the *Maenofferen Section*. Two large sections of the surface of this area, 131,000 sq m, have been historically used for tipping of slate waste. These areas are defined as Area R and Area S on the plan and are described later under those titles.
- 16.24 New surface working at Maenofferen is planned to start towards the end of the five year period. As the area has not been worked for some time it is difficult to calculate the likely volumes of waste or the quantities of topsoil that may arise from site clearance. However, records indicate that in the principal area to the east of the current working area the average depth of waste rock overlying the main slate beds is of the order of 30 m while to the southern edge of the area the thickness reduces to almost nil. An average depth over the whole area of 15m has been adopted to calculate a total volume of 6,813,000 cu m of waste in area A. This excludes the existing waste tips R and S which will have to be disposed of over the life of the operation.
- 16.25 Topsoil calculations are equally difficult to predict with any great certainty with all but about one third of the entire area already having been stripped or tipped on. A topsoil depth of 150 mm has been assumed for the area of grassland on the eastern section of the area giving a total topsoil volume of 22,700 cu m. The area to be stripped in the first five year plan will generate 1,000 cu m of topsoil.
- 16.26 The first phase of working in Area M will also require the construction of two new access roads which are shown on plan LLECH.97.04. A further access road is also proposed to provide a new link between the Maenofferen and Llechwedd sections. This road will be constructed along, or parallel with, the route of the tramway which runs along the northern boundary of Area P and Area O into Area C, a distance of about 500 m. Since area C is only slightly lower than Maenofferen this would be a practical route avoiding steep haul sections. This route will also provide access for the future tipping of Area O without having to cut across the incline of the Rhiw Bach Tramway.
- 16.27 There is at present a pinch point on the access route between the sub station, which is a listed building, and the stream to the north of the trimming sheds at Maenofferen. This will be overcome by strengthening the retaining wall, thereby enabling the road

to be continued in a straight line westwards. The position of the road is shown on plan LLECH.97.04.

- 16.28 There are also some water management problems at Maenofferen which need to be resolved. It is proposed to construct a cut off drain alongside the new access track referred to in paragraph 16.26 for this purpose. This would take the water, presently going under the tip, to the incline area, or possibly all the way to the Maenofferen power house at the southern end of area C.

#### *Area N*

- 16.29 This is a redundant tip that has started to colonise in places with pioneer plants. There are some areas which have ended up with fine materials on the surface and some of these will be selected and planted to encourage further plant cover to spread. The eastern and southern faces of this tip will however be excluded from this treatment as it will be partly covered by future tipping. At the higher altitudes of Maenofferen fewer trees will be used as grass and plants such as heather and bilberry are more appropriate.

#### *Area O - Rhiw Bach Incline Tip*

- 16.30 This is an approved new tipping area with a total capacity of approximately 2,500,000 cu m. A **Phase 1 Habitat Survey** has been carried out on this and the adjoining Area P which is reproduced as **Appendix 2** to this statement. There is a public footpath in part of area O which would have to be diverted, presumably on to the incline, which is in fact where everyone presently walks.

#### *Area P - Maenofferen Mill Tip Extension*

- 16.31 The northern section of Area P, which has the capacity to take about 200,000 cu m of waste tipping, will be required for material generated by both surface and underground working within the *Maenofferen Section* over the first five year plan. The area which is to be filled, between the existing tip edge and the incline to the west, has some topsoil cover, but it's removal would be too difficult. The **Phase 1 Habitat Survey** reproduced as **Appendix 2** indicates that the area has no plants of any special interest.
- 16.32 In consequence of the above it is proposed that topsoil from the first phase of work in Area M be used for restoration work on Area P. If the quantities prove inadequate it will be possible to establish suitable plant cover without topsoil by using different methods and materials.

#### *Area Q - Maenofferen Mill Tip*

- 16.33 This current tipping area, which is nearing its final capacity, also provides a valuable storage area for material and goods for the *Maenofferen Section*. It is proposed that storage areas be better defined and the final tip profile of the remaining area restored.

*Area R and Area S*

- 16.34 These two areas or former tips will be removed to gain access to the slate beds underneath.

*Area T*

- 16.35 This old tipping area has started to regenerate naturally in some locations. It is not proposed to carry out any further works except some limited planting similar to that proposed for Area G in areas where there are plenty of fines. The southern half of this area has not yet been tipped. Future tipping on this area would provide the opportunity for creating an improved profile for the tip when viewed from the town to the south. This possibility will be examined in detail at a future review of this plan.

*Area U*

- 16.36 The same comments apply to this area as Area T. Some limited restoration will be undertaken on the tips which face the town.

*Area V*

- 16.37 This is the area covered by the Votty and Bowydd land reclamation scheme. It is not proposed to carry out any works in this area.

*Area W*

- 16.38 The area is fully tipped and no additional tipping is planned.

*Area X*

- 16.39 This is an active tip which has permission for further tipping. The major use of this area will occur when the western end of the Area M surface working area is developed. It is unlikely that much tipping will take place here over the next five years.

*Area Y*

- 16.40 Although this area enjoys planning permission for tipping it is not included in current plans.



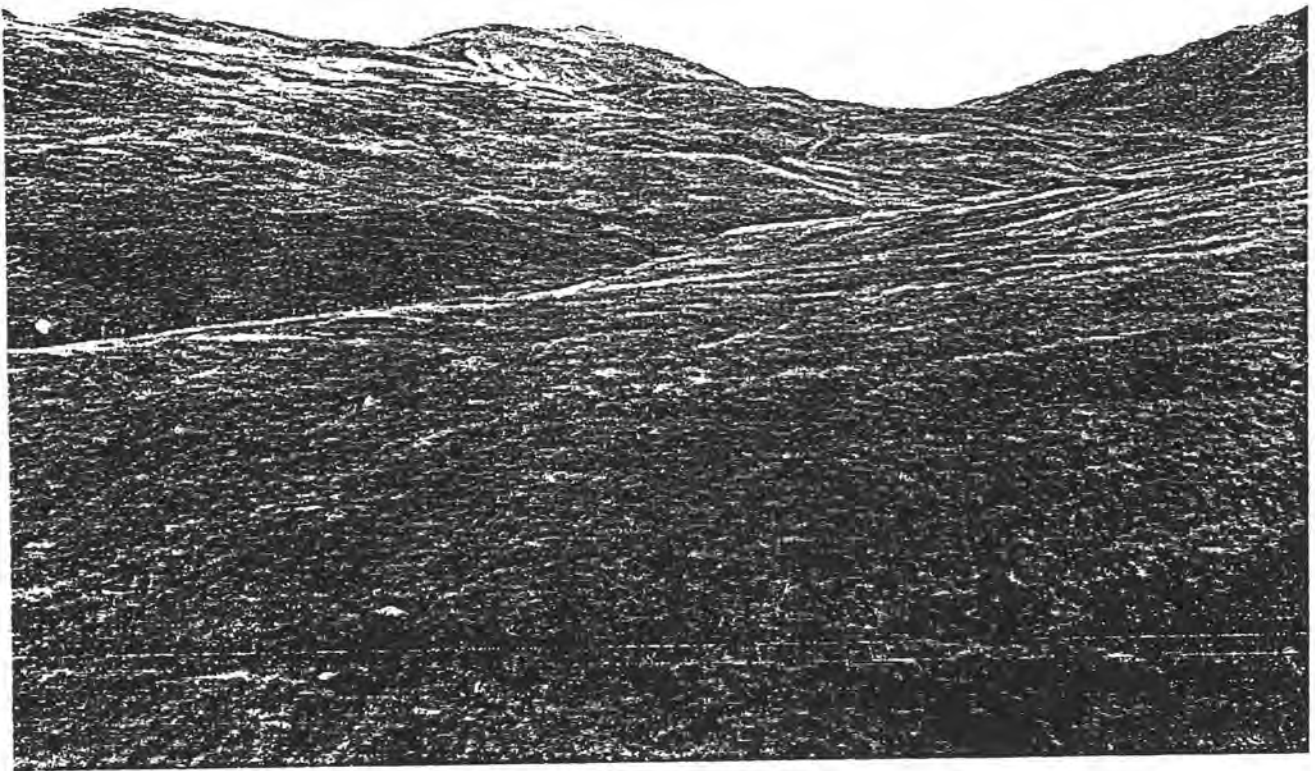
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## **Appendix 1a**

### *Archaeological Assessment - Llechwedd section*



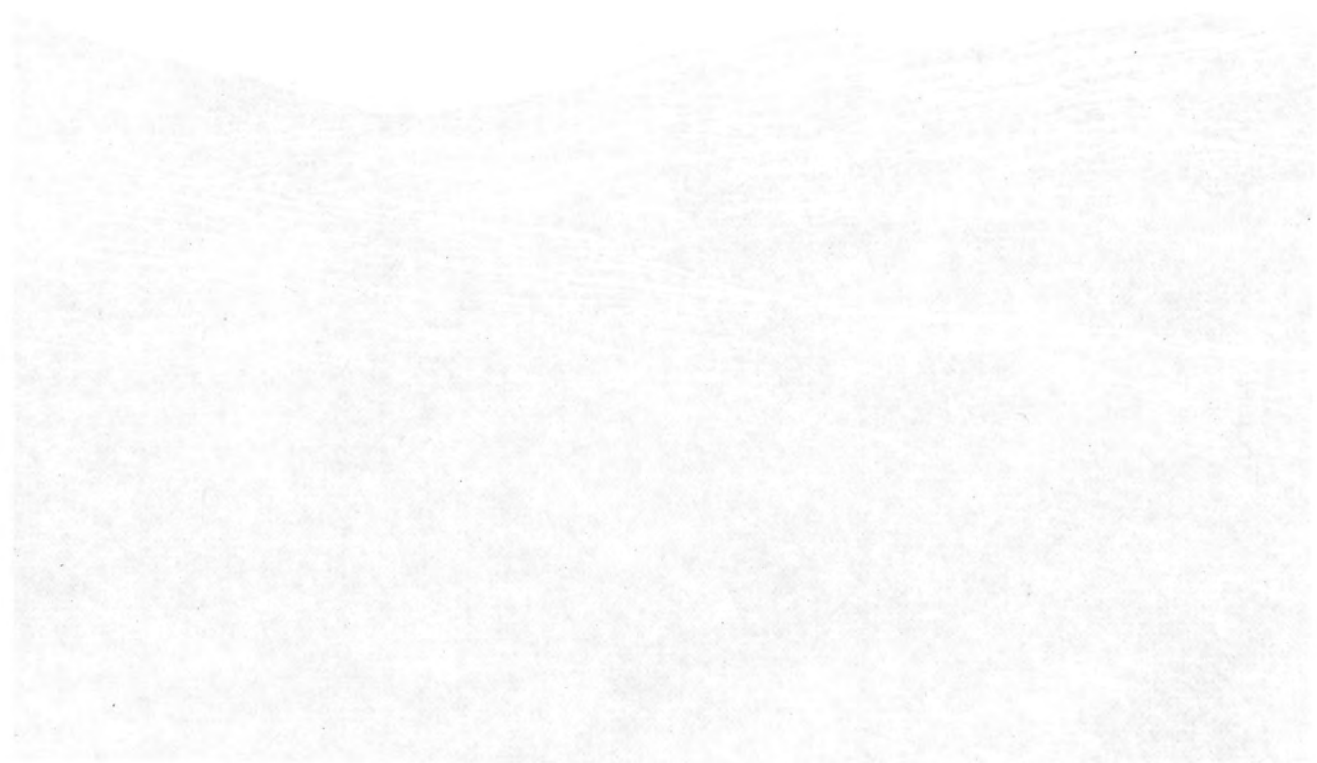
LLECHWEDD SLATE MINES  
BLAENAU FFESTINIOG



AN ARCHAEOLOGICAL ASSESSMENT

John Manley  
MA, MIFA  
November 1991

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1964

## LLECHWEDD SLATE MINES, BLAENAU FFESTINIOG, GWYNEDD

AN ARCHAEOLOGICAL ASSESSMENT.  
by John Manley, MA, MIFA.

1. The land that forms the subject of this report, and comprises the area of the proposed tip, lies some 400 metres north-east of the Llechwedd Slate Mine Tourist Complex, centring on NGR SH704472 (fig. 1). The area of land is roughly triangular in plan, with its highest point in the north-east at the top of the triangle. The sides of the triangle are formed by the Afon Barlwyd on the west, and a trackway to the east. The base is formed by a large opencast slate quarry pit. The area of land is approximately some 13 hectares. The slope of the land is from the east to the west, generally trending towards the Afon Barlwyd. The average height is some 350 metres O.D. The vegetation cover consists of some rough hill grazing, with moss and rushes in low-lying waterlogged pockets. Some small tributaries flow east to west across the site into the Afon Barlwyd.
2. The application site was closely inspected by field-walking and some 14 sites or features were identified and recorded (fig. 2). Preliminary, on-site evaluation suggested that the remains and features fell into two broad date ranges. At the north-east end of the site there are two, possibly three, hafotai (summer farm-houses) with a potentially associated adjacent hollow-way. These probably date from the 16th to 19th centuries. The southern end of the site contains a complex of depressions and channels, one open shaft, and a large standing rectangular building. These remains are likely to be 19th and 20th century in date and relate to industrial uses.
3. Detailed list of sites and features of archaeological interest:
  - 3.1 Remains of a rectangular building with stone footings of local stone. It is orientated north-east/south-west, the long axis south-west/north-east being 6.70 metres and the shorter 4.80 metres. The average wall width is 0.65 metres and the average wall height 0.30 metres. The entrance was probably in the south-east corner. The building is sited on a small terrace approximately 5 - 10 metres east of the stream and is overlooked by higher ground to the east. It has good views to the north (uphill) and south (downhill) along the valley.
  - 3.2 Remains of a rectangular building with stone footings of local stone. Orientated north-east/south west. The short axis south-west/north east measured 6 to 7 metres and the long axis north-west/south-east, 7.20 metres. The wall width averages 0.75 metres and the average wall height is 0.06 metres, rising to 1.00 metre. This building is also sited on a small terrace around 20 metres south-east of the stream. It is overlooked to the east by higher ground with sloping ground to the west down to the stream.

- 3.3 Hollow-ways which are formed by linear depressions running north-east/south-west. Where they are best preserved two depressions lie parallel and seem to come from hafod number 2. They then slope down south-west bringing them closer to the stream. Large granite boulders - some in excess of 1.0 metre in diameter lie mostly to the sides of the hollow-ways on ground which slopes towards the stream.
- 3.4 Possible hafod - or possibly fortuitous collection of fairly large stones, the 'building' measuring east to west 5.60 metres and north to south 6.00 metres. The average stone size is 0.6 metres, the average wall width 0.50 metres and the average wall height 0.30 metres. It is situated close to the hollow-way which lies immediately to the east; it is on level ground which then slopes down to the stream. It is overlooked by higher ground to the east with good views north and south and to the west up the far valley side.
- 3.5 On the steep west slopes lies a trackway which is grass covered and approximately 2.00 metres wide on average. It is not morphologically a hollow-way and it is uncertain whether it is associated with the hollow-way to the north.
- 3.6 At SH70374724 there is a 4.00 metres wide bridge or dam to direct water to the north down a channel. It is 5.8 metres long, 3.00 metres wide and 0.9 metres deep. The east side is made of vertical slate slabs pegged with steel bars; on the west side are small granite boulders. West of the dam is a substantial curving, linear depression, ultimately linking with others to run into the Afon Barlwyd.
- 3.7 This feature consists of an old shaft roughly circular 2.5 metres in diameter which has no visible bottom. It was used for pumping rods to empty water from the slate quarries. There are remains of a rectangular upstanding masonry surround 0.90 metres wide and 0.5 metres high on the east side.
- 3.8 Rectangular building - see description below.
- 3.9 This entrance to an old slate quarry is some 2.00 metres high and vertical on the south side, and has a 45° angle on north side following the line of slate.
- 3.10 This is an entrance to a slate mine/quarry which is 2.5 metres wide by 1.5 metres high and is vertical on both sides.
- 3.11 A dump of slate from the quarry to the south-east is approximately 10 metres above ground level at its highest point.
- 3.12 2 vertical and 1 central stone piers once supported a bridge across the water course. The middle pier is 1.4 metres high and 1.3 metres in diameter. The overall distance from outside pier to outside pier is 10.40 metres.

3.13 Channel to remove water from wheelhouse(standing building No 8). The width is 3.00 metres, the depth is 1.5 metres and it is grass covered. The ground to the south is much higher and water could have been delivered by a timber launder to the wheelhouse (building No. 8). This linear channel is 5.5 metres wide and 2.0 metres in depth at SH70444744.

3.14 Dry-stone field wall with a ditch on its east side.

4. Description of standing building No.8:

A long rectangular standing building, orientated north to south, lies close to the centre of the application site. The building is associated with a platform and various channels, and has been extended with the addition of a crudely-built enclosure on its western side. This enclosure, formed by the addition of curved and straight lengths of wall of largely inferior masonry compared with the rectangular building, has the appearance of a later sheepfold, no doubt appended when the primary industrial use of the rectangular building had ceased. The walls and associated features of this complex were drawn (fig. 3) and are described in the following section.

5. Detailed description of building No.8.

5.1 Inside face: The south side is built of granite boulders. The north end consists of more irregular ironstained stones. Along the centre there is an area of slate slabs which is evidently a repair. The average height is 5.0 metres.

Outside face: An offset ledge occurs at 1.5 metre above ground. The north half consists of iron-stained boulders with granite blocks. There is a modern opening low down in the wall.

5.2 An offset in the southern half at 1.9 metres above ground on the outside face is probably the same offset as in 1. The wall is comprised of large granite boulders. The maximum height is over 5.0 metres - 6.0 metres in the south-west corner. There is a clear vertical line between the building and buttress implying that the buttress was built later.

5.3 The damaged west wall to the building varies in height from 5.0 metres at bottom end to 2.0 metres in the middle. Stone-work from this wall has collapsed into the large rectangular pit inside the structure.

Outside Face: The south part of the wall is made of massive granite boulders 0.6 metres long on average. The north end is largely built of massive irregular iron-stained stones, some in excess of 1.0 metres in length. At the north end of the wall there are 5 upper courses of masonry built from roughly dressed granite blocks.

Inside Face: Largely obscured by rubble but some mortar is apparent between stones.

- 5.4 The mortared north end of the building was badly disturbed with a maximum survival height of 3.0 metres. It comprises massive iron-stained boulders. The north-west corner has probably been damaged by some large machine.
- 5.5 The solid buttress was built of local granite boulders which from surface to the highest point is 3.0 metres. The average stone length is 0.5 metres.
- 5.6 This roughly built curved wall is made of a variety of stone, slate and concrete, with a quantity of re-used brick. The predominant stone used is the local granite.

The wall is clearly not bonded with the buttress and it almost certainly represents a later construction attached to the main building at a height of 1.5 metres.

The rectangular opening through the wall suggests a possible use as a sheep pen.

- 5.7 This wall is of a better construction than 6, with mortar joints in evidence. Is built of irregular iron-stained blocks with some slate slabs and survives to an average height of 1.4 metres.
- 5.8 This distinctive wall built almost entirely of slate slabs is of dry stone construction and has an average height of 1.5 metres.
- 5.9 A crudely built dry stone wall built of irregular iron-stained blocks, some granite and bits of slate with an average height of 1.1 metres.
- 5.10 Another crudely built dry stone wall constructed of irregular iron-stained boulders, some granite and slate with an average height of 1.0 metres.

Walls 7 and 8 appear to have been constructed much more carefully than walls 6, 9 and 10. This may suggest at least a 2 phase use for these outer walls on the western side of the primary building.

- 5.11 This is an area of iron-stained boulders with an average height of 0.5 metres. There is no really clear evidence of a wall face. There is a possible buttress at the north east corner but not much evidence of collapsed stone.
- 5.12 A revetted platform is walled to the south and north. The south wall is 1.2 metres high. The east side is formed by a bank of a linear channel. This is possibly a platform for a

building, or something to do with water delivery to the building.

5.13 A linear channel to the east of the building has a pronounced 'U' shaped ditch, which is raised more at either side of the building, to the north and south of the structure. The average depth at the south of the building is 1.3 metres.

5.14 Part of a complex of linked, stone-lined channels. Their average width is 0.9 metres to 1.00 metres and average depth is 0.7 metres.

## 6 Interpretation and Analysis.

The group of small, rectangular buildings (fig. 2 sites 1, 2 and 4) and the hollow-way (fig. 2 site 3) appear to form a cluster of hafotai with an associated trackway. Their position near to a source of running water and at an elevated altitude between 350 metres and 400 metres OD is fairly typical. It is not known for certain when the practise of moving from the hendre (lowland home farm) to hafod (upland summer farm) became established in Wales. There are records of hendre/hafod settlements from the 13th century; the practice of the transhumance between such sites may be glimpsed in some references in the Domesday Book (Davies, 1977); the 'alternating pasturage' of Gildas might even be taken as a passing reference to the seasonal movement of herds and flocks (Ryder, 1981, 336). The historical focus then disappears into the blur of prehistory. It may well have its origins, therefore, in the early medieval period and was certainly widespread in North Wales during the later medieval and post-medieval periods.

These two or three hafotai presumably controlled grazing on, and access to, the rough pastures to the east and north-east, between Llyn Barlwyd and Llyn Newydd. Single hafod structures or groups of hafotai can be paralleled throughout Wales, from the Rhondda Valley (Davies, 1988), and the Black Mountains (Ward, 1988) to the uplands of Gwynedd (Latham & Plunkett Dillon, 1988) and Clwyd (Allen, 1979). The latter report is concerned with the excavation of several hafotai in western Clwyd, which proved to be of late 15th to early 16th century date. In Gwynedd Thomas Pennant provided a valuable description of hafotai in Snowdonia as late as 1781:

'These houses consist of a long, low room with a hole at one end, to let out the smoke from the fire, which is made beneath. Their furniture is very simple stones: are the substitute of stools and beds are of hay ranged along the sides'. (Pennant 1781)

With regard to the standing building Number 8 there appears to be little surviving documentation as to its date and function. Very little information on the building could be obtained from the Royal Commission on Ancient and Historical Monuments, the Gwynedd County Council Archivists or the Sites and Monuments Record of the Gwynedd Archaeological Trust. However it has been possible, from local

knowledge, to ascertain that the structure was known as "Tŵll yr Olwyn Goch". It therefore contained a large water-wheel which was supplied by a launder that carried water to it from a stream further up the hill. It seems likely that the water-wheel was used in two distinct ways. Firstly to haul waggons up the old incline from the slate quarry known as Sinc Mynydd, and secondly to pump out water from the quarry. Mechanical power was transferred from the wheel down an associated vertical shaft (Fig. 2 No 7) which was positioned directly over the head of the old incline. It is understood, from the Mine Surveyor, that a 1902 Tapp & Jones cross section of this part of the Mine exists, which details, at a small scale, a profile of the Olwyn Goch. Apparently, the idea for the water-wheel was a brainwave of the blacksmith of the quarry company, who was paid £3 for his ingenuity. The building was therefore constructed probably around the mid-19th century and went out of use in the early 20th century when a new incline was constructed. A pumping-wheel of this type was not uncommon in the lead mines of south-west Wales, but its employment in the slate industry was unusual. It therefore probably represents the use of somewhat out-dated technology to solve a particular problem at Llechwedd. To the south of the building are some stone-lined channels, presumably to carry excess water or pumped water away from the building and westwards, down to the Afon Barlwyd. These stone-lined channels apparently line up with some much bigger depressions further down the slope.

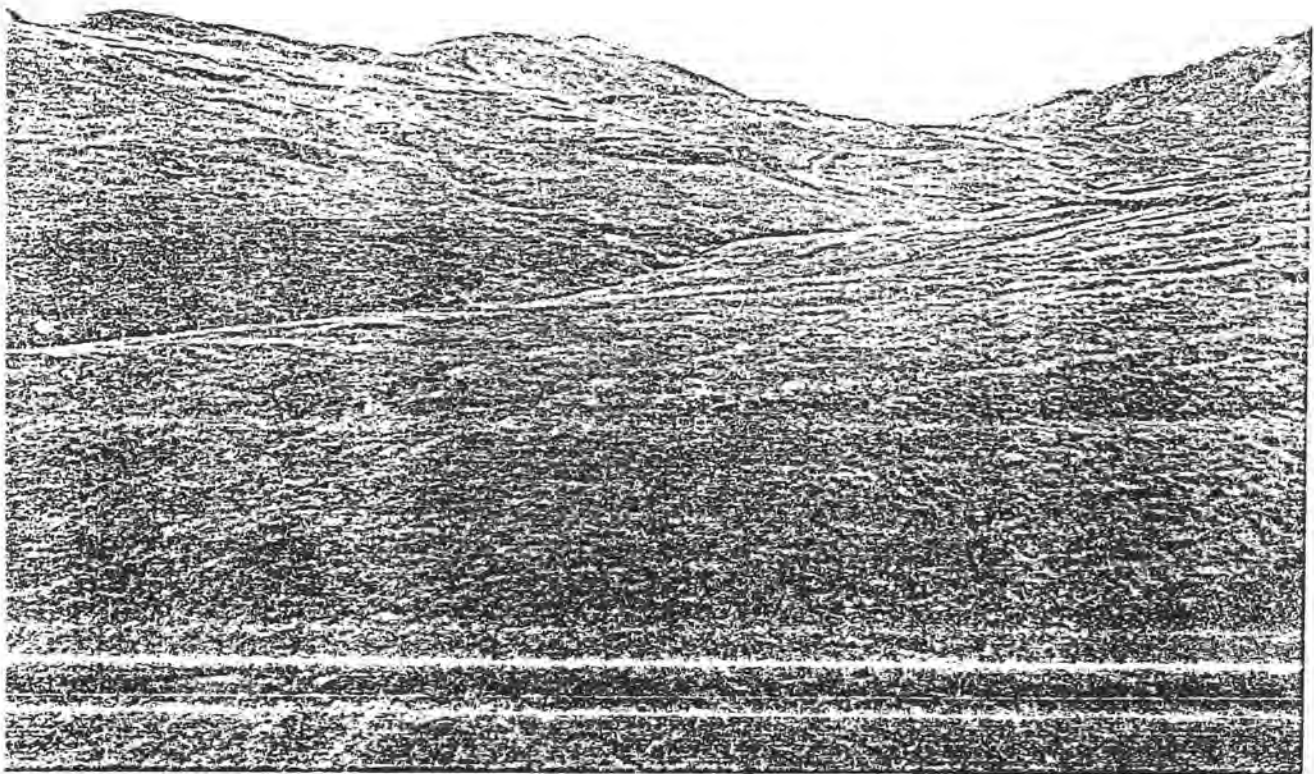
## 7. Recommendations.

The land in question clearly has some archaeological significance, with agricultural remains of the early post-medieval period and industrial remains of the 19th and 20th centuries. If the proposals for slate tipping or extraction proceed the following recommendations to record or safeguard the archaeological features should be followed.

- 7.1 The northern end of the application area should be excluded from the proposals, so preserving intact the two definite hafotai (fig. 2 Nos 1 & 2). The tipping should come no closer than 25 metres to the hafod No 2.
- 7.2 A cross-section through the hollow-way should be made and the section recorded by a qualified archaeologist.
- 7.3 The shaft (No 7) should be capped with a concrete roof capable of withstanding the weight of tipped material above it.
- 7.4 A detailed photographic record using rectified photography should be made of all the elevations and features of building No 8. Interpretative drawings should be prepared from the photographs.
- 7.5 Tipping of waste in and around this building should be done in such a way as to ensure that the fabric of the building remains buried but standing after the tipping.

- 7.6 A detailed ground survey plan should be made of all pits, platforms and depressions apparently associated with building No 8; in the southern half of the application site.
- 7.7. Should the southern section of the application site (including the Olwyn Goch and associated shaft) fall within a quarrying area, the proposed photographic detail and ground survey outlined in 7.4 and 7.6 is considered to be sufficient for the Archaeological Record.
- 7.8 The archaeological substance of this report, and any archaeological information resulting from the above recommendations, should be lodged with GAT, RCAHM (Wales) and the Gwynedd County Archivist.

## PHOTOGRAPHS



The captions in the following section refer to individual sites. The site numbers are detailed in Section 3 of the report; their locations are fixed on Fig. 2.

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## **Appendix 1b**

*Archaeological Assessment - Maenofferen section*



## 1 Introduction

- 1.1 This report documents the results of archaeological assessment of five areas of land at the Llechwedd slate mine complex, Blaenau Ffestiniog, Gwynedd. The work was conducted to feed into quarrying related development plans sensitive to the character of the region's historic landscape. The locations of the five Archaeological Survey Areas are depicted on plan **LLECH.97.ARC01**.
- 1.2 Field work took place over four days between the 14th and the 19th of January 1998. Each area was intensively surveyed to walk-over specifications. All identified features of archaeological significance were mapped at a scale of 1:2500 and detailed written descriptions made. A photographic record archive was taken, and is available on request, covering all but the most ephemeral of the identified remains.
- 1.3 The findings may be characterised into two broad groups defined on the basis of chronology and function. The first relates to agricultural exploitation of the landscape between the sixteenth and the nineteenth centuries. The practice of transhumance agriculture has a long antiquity in North Wales. It entailed the movement of people and their animals from the hendre (lowland farm home) to the hafod (upland dwelling) during the summer months to make use of upland grazing. The practice has been discussed in more detail as part of an earlier archaeological assessment conducted at Llechwedd (Manley 1991). The uplands were also exploited for peat. Peat formed a major source of fuel in the area from at least the early seventeenth century (Crew and Musson 1996, 42). The activity remained an important feature of the agricultural year until well into the nineteenth century. Peat was cut during the spring and was left to dry over the summer months until it had lost much of its weight and could be more easily transported. Sleds were often used to facilitate the carrying of the peat down to the lowlands. The second group of findings derives from industrial activity associated with slate quarrying, occurring between the late eighteenth and early twentieth century.
- 1.4 In the text which follows, the five archaeological survey areas are discussed separately for the sake of clarity. The following format is adopted for each area:
  - Gazetteer of detailed feature descriptions including provisional interpretations of date and function.
  - Synthesis in which features of particular importance or interest highlighted.
  - Recommendations made to mitigate the impact of the proposed slate extraction and tipping schemes on the archaeological remains.

## 2 Archaeological Survey Area One

### *Gazetteer of feature descriptions*

- 2.1 Features are numbered with a prefix which identifies the survey area to which they relate, in this instance 1.-. The positions of the features listed below are fixed on plan **LLECH.97.ARC02**. Features lying immediately beyond the limits of the survey area but pertinent to the development proposals have been recorded, but are lettered rather than numbered, and are described at the end of the gazetteer.

- 1.1 Two celled rectangular buildings situated at the foot of the Diphwys Casson tip. Oriented on south-west to north-east axis. 9m long by 4 to 5m wide. Walls 0.5 to 0.7m wide surviving to maximum heights of 0.8m and 1.4m respectively for the west and east cells. Doorways in south-west and north-east corners of building (both c. 1m wide). No internal access between the two cells. A wall leading from north-west corner is buried beneath tip. The function of the building is unknown. The buried wall spur would suggest that the building is at least as old as the earliest phases of quarrying at Diphwys (latter half of the eighteenth century). The building shown on the 1888 6" OS map. The layout is suggestive of an agriculturally related building, but is not particularly consistent with hafod found elsewhere during the survey.
- 1.2 Poorly defined routeway.
- 1.3 Ancient footpath now visible only as vegetation differences.
- 1.4 Possible building remains consisting of a split level double platform. Rectangular in outline, 10m long by 4 to 5m wide. Long axis oriented south-east to north-west. Hillside to east of building possibly cut into to produce level platform for building. East wall utilises earthfast boulders as part of alignment. Outline visible in the form of soil build up and vegetation differences over traces of robbed out boulder walling. Possible remains of early hafod. Tracks 1.2, 1.3 and 1.6 seem to respect the position of the feature, further supporting its interpretation as building remains.
- 1.5 Possible building platform. No structural remains visible. Dimensions: 5m (north-south) by 3 to 5m (east-west).
- 1.6 Shallow sunken routeways, poorly defined in places.
- 1.7 Heavily vegetated stone-paved footpath running between tramway (1.A) and trackways (1.6). Superseded by feature 1.9a, which also gives access to tramway.
- 1.8 Well preserved slate-slab steps leading from causewayed footpath (1.9) to tramway (1.A).
- 1.9 Trackway. Major line of communication running east-west through Archaeological Survey Area One. The character of the feature changes along its length as described below, from east to west (and shown on plan **LLECH.97.ARC02**):
  - 1.9a Stone surfaced, causeway trackway. 1.7m wide, and raised above ground surface by up to 0.5m. A narrow drainage channel runs along the west side of the trackway.

- 1.9b The feature continues beyond the point where 1.9a and 1.11 meet as a vegetated terraced trackway. This portion of the trackway appears mostly unpaved, but a granite and slate surface is visible in places.
- 1.9c Sunken/hollowed length of trackway. 1.5m deep and 2m wide at greatest extent.
- 1.9d Track causeway and surfaced with granite blocks to prevent erosion where it runs across steep ground beside stream. Up to 2m wide for most of this section. The southern edge of the trackway is kerbed with large granite blocks, producing an attractive effect.
- 1.10 Relict sections of two terraced footpaths, 30 to 40m in length and between 2 and 3m wide. The footpaths are continuations of trackways 1.6. They are overlain by, and therefore pre-date, 1.9a which is the northern spur of trackway 1.9. They are buried beneath a slate waste tip to the east. Not depicted on 1888 6" O.S. map. Evidence suggests that last in use during early phase of quarrying activity in the locality (late eighteenth century), but likely to be considerably older in origin.
- 1.11 Terraced trackway. Appears to be original route of trackway 1.9 superseded by the construction of northern spur 1.9a. 1.11 probably fell out of use following the advent of later eighteenth and nineteenth century quarrying and waste tipping, beneath which it is now buried to the east. No trackway is depicted in the position of 1.11 on the 1888 6" O.S. map, which shows trackway 1.9 continuing along the line of 1.9a.
- 1.12 Short length of sunken trackway running through area of eroded peat cuts. Less than 2m wide and 0.5m deep. Part of a feature marked as a footpath on the 1888 6" O.S. map, the continuation of which (seen running north-east on the map) is no longer detectable on the ground.
- 1.13 Eroded peat cut, or possible building platform (no structural remains visible). Dimensions: 6m north-south, 8m east-west.
- 1.14 Terraced footpath, 1m wide. Eastern end buried beneath waste tip.
- 1.15 Ruined dry-stone wall, 0.5 to 0.7m wide and surviving to a maximum height of 0.5m. The wall is uncoursed and comprises of rough granite blocks.
- 1.16 Two lengths of tumbled dry-stone walling, the southern most of which continues beyond the survey area towards ruined hafod, 1.B. Similar build to 1.15. The sections of wall recorded as 1.15 and 1.16 are built to define the same boundary, where this boundary is not otherwise defined by natural obstacles such as large boulders, rock outcrops and stream courses.
- 1.17 Gateway through wall and footpath paved in places with slate slabs.
- 1.18 Footpath/trackway. 1888 6" O.S. map indicates that 1.14 and 1.18 are part of the same routeway. The intermediary section is now buried beneath the slate waste tip.
- 1.19 Zigzag trackway leading up hillside. Very little of the feature survives, most of it being buried beneath waste tip. Probably dates to at least the early phases of quarrying in the locality (later eighteenth century), if not to pre-quarrying access to moorland and upland pasture.
- 1.20 Holloway/sunken track. Dimensions: 1.5m deep and 3m wide at greatest.

- 1.21 Ruinous dry-stone wall. Survives as patchy footings of large granite boulders (up to 1m by 1m in size). Wall also incorporates several large earthfast boulders. Continues south-west beyond survey area to feature 1.C.
- 1.22 Small granite outcrop, maximum height 4 to 5m. Possible site of small scale quarrying for walling stone. Quarrying debris lies at foot of northern part of outcrop and has probably been used to construct 1.C.
- 1.23 Ruinous sections of dry-stone walling. Taken together, the sections mark out a boundary where not otherwise defined by rock outcrops and cliff faces.
- 1.24 Eroded peat cut, 5m by 5m.
- 1.25 Area of possible peat cutting activity.
- 1.26 Two small gullies leading through broken, craggy ground. Depth of gullies possibly emphasised by use as sled routes for transporting peat from area immediately upslope (1.24 and 1.25).
- 1.27 Low (0.5m high) and wide (3m) linear earthwork bank. Function unknown, but probably related to peat cutting (possibly the remains of a baulk left between two episodes of cutting).
- 1.28 Low earthwork bank with sunken gully (5m wide) to south side. The bank is 2m wide and less than 0.7m high. The topographic location of the features, a hillock on the ridge which defines the southern side of the survey area, raised the possibility that features 1.28 and 1.27 are relict portions of an enclosed or 'defended' hill-spur occupation site (which would imply a late prehistoric date). However this was not supported by further field observations. No continuations of the features could be traced, and no building platforms or earthwork features were found to the south of 1.28. It is more likely that the features are the product of activities relating to peat cutting.
- 1.29 Eroded peat cut, 10m by 10m.
- 1.30 Holloway/sunken trackway running parallel to part of trackway 1.9. The west end of the holloway is cut by trackway 1.9, which it therefore pre-dates. 1.30 (and 1.38) form an earlier phase of trackway, possibly relating to pre-quarrying period use of the route through the valley.
- 1.31 Tumbled dry-stone wall comprised of uncoursed slate blocks and slabs. Dimensions: 0.8m high and maximum surviving height of 1.0m. A slate slab step-stile is built into the fabric of the wall 10m north of the gateway.
- 1.32 Further sections of ruinous dry-stone walling which run between rock outcrops to form continuous boundary (see 1.23).
- 1.33 Vegetated pathway with sparse footings of dry-stone wall surviving to its south side.
- 1.34 Small foot-bridge over stream, constructed from granite blocks.
- 1.35 5m length of section of granite block revetment at north side of stream. 0.7m high.
- 1.36 Continuation of ruined dry-stone wall boundary defined by 1.23 and 1.32.
- 1.37 Dry-stone walling, maximum height 1m. Hill-wash erosion has led to lyncheting (build up of soil deposits) on east side of wall.

- 1.38 Section of holloway, 1m deep and 2m wide. Overlain in part by trackway 1.9, which it therefore pre-dates (see 1.30).
- 1.39 Eroded peat cut, 20m by 20m.
- 1.40 Three possible eroded peat cuts. Two measure 20m by 20m and the third 10m by 10m. The cuts are sunken below the surrounding ground surface by about 0.4m.
- 1.A Revetted tramway leading from incline (to the east) to Diphwys Casson mill (to the west).
- 1.B Ruined hafod situated immediately to south of a stream course. Focus of walled boundaries 1.15, 1.16 and 1.21, and structure 1.C.
- 1.C Tumbled wall remains of small hut/animal fold associated with hafod 1.B. Dimensions: 4m by 4m.

### *Synthesis*

- 2.2 A large number of features were identified and recorded in Survey Area One (39 in total). Whilst they all contribute to the character of the historic landscape of the area, it is possible to identify the following as having key importance:
  - 2.2.1 Trackway comprising major line of communication through the valley. Consists of 1.9a-d and associated features, 1.12, 1.14, 1.20, 1.30 and 1.38. The feature displays considerable time depth. It was used by quarry workers from the later part of the eighteenth century onwards, following the opening up of the Diphwys Casson quarry. However, older sections of the routeway running beside its present course indicate earlier usage pre-dating the period of large scale quarry operations (1.30 and 1.38). It formed an important access route to the resources of the uplands, and is likely to have been used to: carry peat down to farms and settlements in the valley below; to herd animals between the valley lowlands and the upland summer pastures; and perhaps to transport the products of the small scale opportunist quarrying for slate building material which had occurred in the area for many centuries prior to extensive development of the industry in the late eighteenth and nineteenth centuries (Isherwood 1988, 3). Besides its historical significance, the trackway also makes a strong visual and aesthetic contribution to the character of the local landscape. The stone surfaced and kerbed sections (1.9d) are particularly attractive. The trackway has maintained its significance into the present day; it currently forms the focus for the line of a public footpath.
  - 2.2.2 Features 1.15, 1.16, 1.21, 1.23, 1.32, 1.36, 1.B and 1.C form a group of interrelated walls and small buildings which possibly date back to agricultural use of the local landscape in the late medieval period. Small stretches of crude walling run between the crags and cliffs which lie at the southern edge of the survey area. They emphasise these natural features to delineate a probable land-use distinction drawn between 'infield' land and the summer grazing pastures of the uplands beyond. They are also associated with a hafod (1.B) and its small pen or storehouse (1C) which lie immediately outside the survey area.

- 2.2.3 Feature 1.A, the tramway which lies immediately to the north of the survey area, has considerable 'group value' as a component of the historic Diphwys Casson quarry complex.

#### *Recommendations*

- 2.3 In the event of tipping proceeding over the survey area the following points should be taken into consideration regarding the archaeological remains:
- 2.3.1 This area is not threatened by immediate tipping proposals although permission does exist for its eventual use for this purpose. It is proposed that the archaeological remains (especially the trackway 1.9a-d and associated elements) should be surveyed in more detail prior to tipping and if found to be of special interest the following strategy should be adopted.
- i. A cross-section cut through holloways 1.20 and either 1.30 or 1.38 (to be extended to include adjacent portion of trackway 1.9), and the section recorded by a professional archaeologist. Same procedure to be followed to record a cross-section through stone paved and kerbed section of trackway, 1.9d.
  - ii. Detailed recordings made of at least two representative 4m lengths of stone paved and kerbed sections of trackway 1.9d. Plan view drawings (at scale of 1:20) and a photographic record to be produced for each of the lengths of trackway.
  - iii. The walls 1.16, 1.21, 1.23 and 1.32, which lie either on, or close to, the edge of the survey area, should be excluded from the tipping proposal. This will make little difference to the overall area of tipping, but will safe-guard the character of the boundary and hafod (1.B) group discussed above.
- 2.3.2 Efforts should be made to ensure that tramway 1.A is not damaged or buried during tipping.

### 3 Archaeological Survey Area Two

#### *Gazetteer of feature descriptions*

- 3.1 Features are numbered with a prefix which identifies the survey area to which they relate, in this instance 2.-. The positions of the features listed below are fixed on plan **LLECH.97.ARC03**.

2.1 Remains of a building, the site of which is depicted on the 1888 6" O.S. map as a dwelling, Hen Ty'r Mynydd. The former slate slab roof has entirely collapsed, but the building is generally better preserved than most of the upland dwellings of comparable size in the area. Its walls stand to full height, except for the south end-gable, which is tumbled. The building is rectangular and its long axis is oriented approximately north-south. It is constructed from rough slate blocks and slabs bound together with mortar. The wall stone has probably been quarried from the small cliff which is situated immediately to the east of the building. Patches of plaster survive on the internal faces of the walls.

The building's internal dimensions are 7.2m by 4.7m. The north end-gable is 4.0m at its highest and the side walls are 2.5m at highest and 0.7m thick. There are two windows, which are located opposite each other in the east and west walls of the building. The window to the east has been blocked up. A 2m wide fireplace and the side walls of its broad chimney are situated at the north wall. The building commands extensive views to the north, and westwards down the valley towards the Maenofferen quarry. The ruinous walls of an outhouse lie against the exterior of the north gable-end. The outhouse is 2m north-south, 3m east-west and its walls survive to a maximum height of 1m.

The function and antiquity of Hen Ty'r Mynydd are discussed in the Archaeological Survey Area Two Synthesis, below.

- 2.2 Slate slab 'clapper-fence' (fence line of slates set on-end). Individual slates vary in size between 0.2 to 0.5m wide and 0.8 to 1.2m high. Much of the fence line is leaning or has tumbled as a result of slumping into the water-logged ground across which it runs. Unfortunately, no structural relationship survives between 2.2 and wall 2.13 to allow a chronological interpretation to be made on the relative antiquity of the two features. The line of the fence is depicted on the 1888 6" O.S. map.
- 2.3 Ruinous remains of a storehouse or animal pen. Dry-stone wall construction using surfaced gathered local stone. Walls are 0.6m wide and survive to maximum height of 0.9m. Probable doorway at south-east corner. Internal dimensions: 3m north-south and 2m east-west. The feature probably dates to the earliest period of use of Tan Ty'r Mynydd as a hafod.
- 2.4 Tumbled length of 'clapper-fence'. Fence line shown on 1888 6" O.S. map.
- 2.5 Sunken trackway, 3m wide and 1m to 1.5m deep. Related to quarrying in function and date, as runs north-east to a cut through a small cliff which leads into a level immediately to the north. To the south-west the feature is destroyed by a modern access track (2.7).
- 2.6 Vegetated linear slate waste tip (10m wide at base). Tipping trackway (2m wide) runs along the spine of the tip. Sunken trackway 2.5 runs along its south-

east side. 2.6 is cut by the modern access track (2.7) and 10m further to the south-west, by the Maenofferen Quarry. The eastern edges of this substantial area of quarry working are the same as when depicted on the 1888 6" O.S. map. The small size of tip 2.6 suggest that it results from prospection activities during the earlier history of the Maenofferen workings. The quarry opened in the early 1800's, but production remained relatively small scale until the 1850's (Richards 1991, 133). Tip 2.6 probably dates to this period, the early nineteenth century.

- 2.7 Modern rubble-surfaced access trackway.
- 2.8 Eroded/silted drainage ditches which are up to 2m wide and 0.8m deep. Probably dug in the later part of the nineteenth century to divert the flow of surface water into the Maenofferen Quarry workings. The collected water is shed into the Afon Bowydd culvert at the northern boundary of Archaeological Survey Area Two.
- 2.9 Area of peat cutting. A prominent example is a 30m cut section-side which has a maximum (eroded) height of 0.6m.
- 2.10 Adit. The entrance is 2m high by 2.5m wide. The approach cut leading to the adit is 4m wide and 2.5m high at its greatest. The north end of the cut has been truncated by 2.7, the modern access track. This feature is marked as a level on the 1888 6" O.S. map.
- 2.11 Drainage channels, of comparable form and function to features 2.8.
- 2.12 Dry-stone wall, 1.3m high and 0.5 to 0.7m wide. Its fabric is uncoursed and consists of small and medium sized pieces of surfaced gathered granite with occasional medium sized slate blocks. Mostly tumbled, but some sections survive to original height, and are topped by rough block coping stones. A sheep-through and a step-stile are located in the wall.

To the north, 2.12 has been destroyed by quarrying, whilst to the south it has been buried by tipping. The fabric of the wall is quite different to that of 2.13, and it is suggested that whilst 2.13 is a nineteenth century wall associated with quarry related ownership boundaries (it is respected by tipping from the Diphwys Casson quarries to the south), 2.12 is a relict feature related to pre-quarrying agricultural use of the local area, suggesting a date of construction not later than the eighteenth century.
- 2.13 Extensive dry-stone wall. 2m maximum height, and 0.5m wide. The wall fabric has both irregularly coursed and uncoursed sections, and comprises a mixture of surface gathered and roughly quarried slate blocks and slabs. The wall is tumbled in places, but survives intact, including its topping of block cope stones, for most of its length. Probably a nineteenth century wall associated with quarry related ownership boundaries.
- 2.14 Slate waste tip revetment and platform for the Diphwys Casson drumhouse, which lies to the south. The construction of the feature is of interest as it employs a combination of coursed dry-stone wall at its base which is overlain by a platform of large slate boulders.
- 2.15 Scoop which has been cut into hill-side to facilitate drainage of surface water away from the adit (2.10), by feeding the water collected into channels and ditches.

- 2.16 Area of eroded peat cutting.
- 2.17 Well defined peat cut. Cut section-side survives to a height of 1m.
- 2.18 Shallow sunken trackway Dimensions: 2m wide and 0.5m deep. Faint traces of continuation leading south-east towards Hen Ty'r Mynydd.
- 2.19 Peat cut with two well defined section-sides, 15m by 15m.
- 2.20 Faint traces of pathways
- 2.21 Small disused slate level. Quarry cut is approx. 20m long, 3.5m deep and 3m wide. The cut has been partially infilled at its southern end by the collapse of the side walls and the intrusion of hill-wash material, making it impossible to discern whether or not the cut leads to an adit. However, the relatively small scale of the tipped waste material to the north suggests that underground working did not take place here. The small scale of the quarry implies that it represents prospective working which did not lead to the discovery of workable slate. The feature formed part of the early nineteenth century Hysfa Quarry, which is discussed further in the synthesis for Archaeological Survey Area Two, below. Tipping features to the north of the cut are recorded as **2.21a-e**, depicted on plan **LLECH.97.ARC03** and described below. Stratigraphic relationships between tips **a** to **d** map out a chronology of waste deposition, **a** being the earliest, and **d** the latest.
  - 2.21a Waste tip, 13m by 10m. Maximum height, 1.5m above ground surface.
  - 2.21b Waste tip, 10m by 8m. Maximum height, 1.5m above ground surface.
  - 2.21c Waste tip, 13m by 10m. Maximum height, 1.5m above ground surface.
  - 2.21d Latest and most substantial of the four tips. 30m north-south by 20m east-west. Maximum height 3m above ground surface.
  - 2.21e Sunken trackway leading to tip **d**.
- 2.22 Traces of peat cutting.
- 2.23 Infilled and flooded prospection hollow, 5.m diameter. Marked as a shaft on the 1888 6" O.S. map. A tip of waste material, 10m by 10m by 1.5m high, lies immediately to the east of the hollow.
- 2.24 Evidence for peat cutting on a small plateau of water-logged ground between two craggy rises.
- 2.25 Possible cultivation remains. Six broad raised strips, each about 3.0m wide, separated by narrow furrows (0.4 to 0.5m). Interpretation of the feature is somewhat problematic. It is unlikely that the furrows were cut to facilitate drainage as the higher ground to their south consists merely of a craggy slope. The furrows do not extend far enough southwards to act as channels diverting water away from the east side of the Hen Ty'r Mynydd dwelling. Despite the north facing aspect of the ground on which the strips lie, the evidence is most consistent with spade-dug cultivation. The feature is situated in the lee of the craggy slope, and it is possible that this site was chosen for cultivation in the past on the basis that it was the most sheltered patch of ground in close proximity to Hen Ty'r Mynydd, the dwelling to which it relates. The 1888 6" O.S. supports the interpretation. It depicts a wall, no longer present on the ground, bounding the north side of the plot of ground on which **2.25** is located. Taken together, the evidence may suggest attempts to sustain long term

inhabitation of the site (as opposed to the much more shorter term summer-time use of the hafotai). It may be that during the early nineteenth century, the occupants of Hen Ty'r Mynydd were engaged in dual economic interests, working at the prospection cuts of the Hysfa Quarry, but supplementing this through agricultural activities such as peat cutting (features 2.16, 2.24, 2.26), husbandry and small scale attempts at cultivation (as attested by 2.25).

- 2.26 Sunken trackways, 1.0 to 2.0m wide, leading to peat cuts 2.27.
- 2.27 Two peat cutting sections. Each oriented east-west. Northern most section is approximately 25m long, and southerly section is approximately 15m long.
- 2.28 Length of dry-stone wall post-dating a possible wall-stone quarry and debris tip. The debris spread measures approximately 30m north-south and 10m east-west. The 15m length of low wall which overlies it is built of the same material, rough granite blocks. The wall seems to be the remains of a stock pen which utilised the face of the crag as its west wall. The entrance to the pen lay between the south-west end of the wall and the face of the crag, where it is approached by a poorly defined pathway. The pen is likely to have been used in conjunction the hafod which lies a short distance to the south of it (feature 2.30). Dating ambiguous features of this kind is inherently problematic, but provisionally, a sixteenth to eighteenth century date is likely on the basis of its morphology and its relationship to the hafod.
- 2.29 A narrow prospection cut (1 to 2m wide and 1 to 2m deep) with associated tip lying to the north-east. Probably early exploration work related to either the Diphwys Casson or Hysfa Quarries (i.e. late eighteenth or early nineteenth century in date). An early date is supported by the vegetated condition of the tip area.
- 2.30 Remains of square, single room, building. The building is located in the of a rock outcrop. Internal dimensions of building: 5m by 5m. The walls are between 0.8 and 1.5m wide and survive to a maximum height of 1m. The walls are widest on the south and east sides of the building, where they are built-up to form a horizontal platform against the slope of the hillside. They are of dry-stone construction, utilising surface-gathered medium and large sized granite blocks and some large, roughly quarried blocks (possibly taken from the nearby outcrop). There is an entrance way in the north wall. The building is identified as a sheepfold on the 1888 6" map, but the effort invested in producing a horizontal platform may be taken to indicate that the site was a hafod.
- 2.31 A quarry level or cut, and associated features. These are depicted on plan **LLECH.97.ARC03**, and discussed below, as features 2.31a-d. The level is located above a substantial, quarried, cliff face. It is depicted on the 1888 6" O.S. map and probably dates to the first half of the nineteenth century.
  - 2.31a Short lengths of dry-stone wall, one of which is built across the southern end of the cut, designed to deter animals and people from the large cliff face immediately to the south. Date uncertain, possibly recent.
  - 2.31b Quarried cut, 3.5m deep, on an approximately north-south orientation. 3m wide, widening out to 15m at its southern end, where it meets the cliff at a gully. The level continues a short distance beyond the southern end of the cut in the form of a terrace along the east wall of the gully.

**2.31c** Linear tip, 3m wide and approximately 1.5m high

**2.31d** Large tip and associated trackway. Approximately 40m long and 35m wide, and 10m maximum height above ground level.

**2.A** Prospection cut lying at the boundary of the north-east corner of the survey area, adjoining a stream. Two linear waste tips, one each side of the stream. Southern tip approximately 25m long, northern tip approximately 65m long. Probably formed part of the early nineteenth century Hysfa Quarry complex.

### *Synthesis*

3.2 A large number of features were identified and recorded (31 in all), in Survey Area Two. Whilst they all contribute to the character of the historic landscape of the area, it is possible to identify the following as having key importance:

3.2.1 Features **2.1**, **2.2**, **2.3**, **2.25**, **2.26** and **2.27**, namely the building known as Hen Ty'r Mynydd, and associated features, which include: the ruined pen/storehouse to the west, the area of potential cultivation remains to the north-east, and the peat cuts and trackways to the east. This group of features is provisionally interpreted (on the basis of field observations, old map evidence and other preliminary inquiries) as an eighteenth century hafod and associated pen/storehouse, which experienced reoccupation and maintenance during the early to mid nineteenth century. The latter phase of activity may have been associated with occupants who were also involved in quarrying prospection work as part of the Hysfa quarry complex. The cultivation plot hints at an attempt to dwell in the building on a more long term basis than that implied by its use as a hafod, and is likely to be nineteenth century in date. Together with the peat cuts, the group forms a suite of features of considerable historical interest. The slate 'clapper-fence' which runs on a north-south orientation a short distance to the west of Hen Ty'r Mynydd is a fine example of a type of boundary now relatively rare in the local area.

3.2.2 Feature **2.10**, an adit. Possibly early nineteenth century.

3.2.3 Features **2.21**, **2.23**, **2.29**, **2.31** and **2.A**, namely small scale quarry episodes and prospection cuts. All are likely to relate to early nineteenth century exploration of the area, probably as part of the Hysfa quarry complex which operated in the locality at this time (Richards 1991, 132) or in the case of **2.31**, as part of Diphwys Casson quarry. The small scale of most of the workings indicates that they did not successfully lead to the discovery of high quality slate. The lack of formalised tracks and pathways associated with the features also supports this interpretation as it implies that no great quantity of 'product' material was carried away from the sites. Nevertheless, these features do represent early and historically important events in the history of the quarrying related landscape of the area.

3.2.4 Features **2.28** and **2.30** are probably the most ancient features within the survey area and may date to at least the sixteenth century (late medieval period), on the basis of comparisons with sites elsewhere in the local area and throughout North Wales (see Manley 1991 for review). **2.30** is the remains of a small hafod, whilst **2.28** is a stock pen probably related to the hafod. The sites are well situated to maximise exploitation

of the rough grazing found in the vicinity for summer pasture. That the survey area has historical associations with pasturing is indicated by the name Hysfa, given to the early nineteenth century quarrying in this locality. It is an Old Welsh word meaning 'mountain pasture'.

### *Recommendations*

- 3.3 Archaeological Survey Area Two is the subject of an extraction proposal. The slow progress of extraction in comparison to tipping, suggests that if (as planned) quarrying is to extend eastwards commencing at the old Maenofferen levels to the west of the survey area, then it may be a number of decades before work reaches the first of the features highlighted as of key importance (feature 2.21) in the synthesis above. By the time that work reaches the majority of the key features any recommendations made here are almost certainly going to be in need of reassessment, particularly in the case of features 2.1, 2.2, 2.3, 2.28 and 2.30 which are already in a ruinous condition. However, in the event of rapid encroachment of extraction activities onto the eastern half of the survey area, of extraction taking place on an *ad hoc* basis, or of tipping taking place within the area, the following points should be taken into consideration regarding the archaeological remains:
- 3.3.1 Hen Ty'r Mynydd feature group. Further interpretative insights should be sought from authorities more conversant with the specific late medieval and post medieval history of the area, or through primary documentary research to corroborate the provisional dating and function interpretations expressed in this report. Examples of such authorities and sources for consultation would be: David Gwyn, archaeologist, Gwynedd Archaeological Trust, Bangor; Peter Crew, Snowdonia National Park Archaeologist, Plas Tan y Bwlch; documents held in the archives of the Merionethshire Record Office, Dolgellau. Should the conclusions reached within this report be supported, then the suite of features surrounding and associated with Hen Ty'r Mynydd (2.1), i.e. 2.2, 2.3, 2.25, 2.26 and 2.27 should be preserved *in situ*. This would be best achieved by the exclusion of a rectangular area of land, centred on Hen Ty'r Mynydd (2.1), with dimensions 100m north-south and 175m east-west, from the extraction proposal.
- 3.3.2 If the exclusion of such a large area of land from the extraction proposal is deemed unacceptable, then the following strategy should be adopted:
- Archaeological investigation of 'cultivation plot' 2.25 by trial-trench excavation.
  - A detailed photographic record using rectified photography should be made of all elevations and features of the Hen Ty'r Mynydd building (2.1). Interpretative drawings should be produced from the photographs, and a report prepared.
- The possibility of changing the permitted land to be excavated could be considered.
- 3.3.3 It should be ascertained whether the underground workings relating to the adit 2.10 are documented in mapped form. If this is not the case, then a survey should be commissioned and a report prepared in advance of destruction by quarrying.
- 3.3.4 Features 2.21, 2.23, 2.29, 2.31 and 2.A, namely small scale quarry episodes and prospection cuts. Documentary research should be conducted, and authorities expert

in the early industrial history of the locality (for example David Gwyn, archaeologist, Gwynedd Archaeological Trust, Bangor) consulted to further resolve the following issues:

- i. Historical significance of the features.
- ii. Archaeological importance of the features, evaluated in terms of both their contribution to the character of the quarry related landscape of the Ffestiniog area and more importantly, their potential 'uniqueness' as surviving traces of small scale late eighteenth to early nineteenth prospection.

Recording or preservation policies developed in advance of destruction of the features by quarrying should be based on the results of these consultations.

3.3.5 The hafod, **2.30**, should be either preserved *in situ* by exclusion from the extraction proposal, or should be investigated through excavation by professional archaeologists.

#### 4 Archaeological survey area three

##### *Gazetteer of feature descriptions*

- 4.1 Features are numbered with a prefix which identifies the survey area to which they relate, in this instance **3.-**. The positions of the features listed below are fixed on plan **LLECH.97.ARC04**.
- 3.1 Irregularly coursed dry-stone wall comprised of medium sized slate waste and some large blocks at base. Has distinctive alternating block and slab cope stones. Between 1.5 to 1.7m high and 0.5m wide.
  - 3.2 Shaft or pit roughly capped with slate slabs. The pit has a diameter of approximately 4m. Function unknown.
  - 3.3 Course of ruinous causewayed track. Hollows and piles of demolition rubble suggest former presence of buildings in the area between features **3.2** and **3.3**.
  - 3.4 Single slate slab gatepost retaining iron gate-hanging fixtures. Gateway gives access to 'Quarrybank', the Votty and Bowydd quarry manager's house.
  - 3.5 Overgrown enclosure to south and west of 'Quarrybank' house. The area is currently inaccessible as a result of dense rhododendron growth. Mature cedars and other evergreens are located within this enclosure and throughout the rest of the grounds of the house, forming an attractive collection of features.
  - 3.6 Two sets of fine slate slab steps giving access to each side of the Rhiwbach No.2 incline.
  - 3.7 Roofless remains of the Maenofferen barracks. The building is depicted on the 1888 6" O.S. map and is probably mid nineteenth century in date. The north-west end of the building is best preserved, whilst the extreme south-east end has been destroyed by recent tipping activity. The north-west gable survives intact, but most of the other walls are tumbled to a greater or lesser extent. The structure is constructed on top of a terraced tip.
  - 3.8 Dry-stone wall of similar construction to feature **3.1**. Mostly tumbled, but has same distinctive arrangement of block and slate slab cope stones as **3.1** where survives to full height. Between 1.5 and 2.0m high.
  - 3.9 Sunken ground to north-east of barracks terrace, which, along with feature **3.10** may suggest area of ponding. Possibly functioned to hold flood-water draining from steep ground to the north and divert it away from bottom of Rhiwbach no.2 incline into culvert to east of barracks (**3.A**).
  - 3.10 Slate slab and iron rail walling. 0.9m high, but iron rails extend to height of 1.5m, suggesting that a second course of slates has been removed from the feature. Build up of soil deposits to either side. Possibly constructed to retain water in ponded area to south-east.
  - 3.11 Thin deposit of early tipping which pre-dates footpath **3.23**.
  - 3.12 Three slate built stanchions which support the iron girder base of a bridge across the Rhiwbach no. incline. The bridge itself is no longer extant. The tallest stanchion is approximately 3m high.
  - 3.13 Terraced footpath. Buried at its south-west limit beneath upcast from modern access road to Maenofferen mill. An iron post and haul-wire fence runs along part of the north side of the footpath.

- 3.14 Thin covering of vegetated tipping material.
- 3.15 Stone built terraced footpath or causewayed track, buried on east side by tipping.
- 3.16 System of leats and ditches. These features may have originally formed as sunken trackways but have been subsequently adapted to divert water away from tips to the north and west of the survey area.
- 3.17 Sunken water tank lined with slate walling. Dimensions: 2m by 4m. Probably built to control flow of water from gully upslope (to east) into leats below.
- 3.18 Rock-cut tramway and 'cut and cover' tunnel constructed to carry waste from the Maenofferen quarry for tipping on the old Votty site (Richards 1991,134). The tramway was constructed in the early twentieth century. It is not depicted on the 1901 6" O.S. map, but is marked on the later edition of 1920. The rock-cut section is between 2m and 3m wide. The tunnel section carries the tramway beneath the Rhiwbach no.2 incline. The western mouth of the tunnel is currently part blocked by rock collapse. The slate walled and slab covered structure of the squared eastern mouth of the tunnel is approximately 2m by 2m.
- 3.19 Well preserved Rhiwbach no.2 counterbalance incline. Opened in the mid 1860's (Richards 1991, 138). Rails and some rollers survive *in situ*.
- 3.20 Bridge built to carry early twentieth century Maenofferen tramway (3.18) over culverted water course (3.21) in natural gully. Consists of 4m by 4m wood and iron rail platform (now mostly collapsed) supported on impressive slate built structure. The tallest part of the structure is between 7 and 8m high.
- 3.21 Leat running along natural stream gully which originally carried water from the culverted Afon Bowydd to power the mills of the Bowydd quarry. The leat is depicted on the 1888 6" O.S. map and was probably constructed in the mid nineteenth century. Only a short, ruinous, section survives in the survey area. the rest being buried beneath tipping from the Maenofferen quarry. The leat is 1m deep and 2.5m wide, and is constructed of slate blocks surfaced with a screed of concrete.
- 3.22 Terraced trackway, revetted (on south side) and rock-cut (on north side) in places. Iron haul-wire and post fencing survives in part, above revetted sections.
- 3.23 Footpath, revetted in places on south side.
- 3.24 Gully of former stream course. Probably a braid of the Afon Bowydd prior to the culverting of the river.
- 3.25 Line of stanchions. The stanchions originally formed part of an aqueduct, and would have carried a launder (wooden water channel). The aqueduct is depicted on the 1888 6" O.S. map, but may have been constructed well before this date. The 1888 map indicates that it carried water to small reservoirs north of the Votty quarry. The stanchions are dry-stone, square-based, slate built construction and are set between 3 and 7m apart. The largest lie at the north of the alignment where they are built up to maintain the level of the aqueduct over falling ground. Maximum dimensions, 1.5m to 2m wide at base and 2.3m high. Line of aqueduct continues north-west beyond Rhiwbach incline as feature 3.28.
- 3.26 Possible former phase of aqueduct, pre-dating the construction of the Rhiwbach incline, visible as short relict section of terraced ground. This suggests that the

stanchions were built in the 1860's, to raise the aqueduct over the Rhiwbach incline.

- 3.27 50m length of slate block surfaced trackway, 1.5 to 2.0m wide. Heavily overgrown. Probably part of routeway depicted on 1888 6" O.S. map. Originally connected to trackway running north-west from Quarrybank house, but now buried beneath huge tips bounding north side of survey area.
- 3.28 Continuation of aqueduct (3.25) to west of Rhiwbach incline. Leat dug into ground surface with slate slab lined earth bank forming west side.
- 3.29 Braided holloways. Marked as footpath on 1888 6" O.S. map. Possibly line of ancient routeways followed by people and animals moving between the valley bottom and the summer pastures of the uplands. Use of routeways for transporting peat from uplands to valleys on sleds may explain the deep scoring of the holloways into the ground surface. Oral history attests that animals have been driven along the routeways throughout the twentieth century (Steffan ab Owain, pers. comm.).
- 3.30 Roofless remains of 'Quarrybank', the two-storey Votty and Bowydd quarry manager's house, and associated outbuildings. The house was probably constructed in the mid nineteenth century. Both the scope of the survey and the impenetrable tangle of rhodedendrons in the area prevented detailed investigation of the site. Unfortunately, the property is currently in a poor state of repair and is threatened by further encroachment of rhodedendrons. The site is surrounded by mature cedars and other trees, and forms an attractive feature of the quarrying related landscape of the area. It commands extensive views south and south-west over Blaenau Ffestiniog and valleys beyond.
- 3.A Portion of peat 3.21 emerging from beneath Maenofferen quarry tip, and running beyond survey area.

### *Synthesis*

- 4.2 A large number of features were identified and recorded in Survey Area Three (30 in total). Whilst they all contribute to the character of the historic landscape of the area, it is possible to identify the following as having key importance:
  - 4.2.1 Feature 3.7, Maenofferen quarry barracks. Important in terms of its contribution to the overall group value of Maenofferen quarry's historic structural remains and to its social history.
  - 4.2.2 Features 3.18 and 3.20, early twentieth century tramway which carried Maenofferen waste for tipping on the old Votty quarry site. The rock-cut terrace, 'cut and cover' tunnel running beneath the Rhiwbach no.2 incline, and the substantial bridge which originally carried the tramway over a diverted section of the Afon Bowydd, are all of technical and historical interest. The features are also visually striking. The route of the tramway forms a prominent landmark within the surrounding quarried landscape.
  - 4.2.3 Features 3.25 and 3.28, launder stanchions and leat respectively. The two features comprise the line of a former aqueduct which carried water to small reservoirs north of the Votty quarry. Probably constructed in the first half of the nineteenth century.

Water power was fundamental to the operation of the quarries for much of their history, and nineteenth century quarrying landscapes were festooned with structures built to divert and carry water. The importance of this feature lies in the past ubiquity of water carrying structures, but their poor rate of survival into the present day. This is probably due to the fact that many had entirely wooden superstructures, which have been long destroyed. The stone built stanchions and cut and banked leat of this aqueduct have survived because of their solid construction.

- 4.2.4 Feature **3.29**, braided holloways. These routeways map out a major axis of communication between the valley below the quarries and the uplands above. They have probably been the focus of the movement of people and their animals between the two areas for many centuries. The depth of the holloways may also suggest that the routeways have been used to carry peat down to the valley on sleds.
- 4.2.4 Feature **3.30**, 'Quarrybank', Votty and Bowydd quarry manager's house. The property consists of a fine, but ruinous building, its outbuildings and its heavily overgrown garden. It forms an important, integral, component of the slate industry's economic and social history, and is an striking feature against the stark contrast of the heavily worked industrial landscape which surrounds it.

### *Recommendations*

- 4.3 Archaeological Survey Area Three covers the ground of the approved new tipping area, Area O (Rhiwbach incline tip) and Area P (Maenofferen mill tip extension), as discussed in the Written Statement paper, of which this report forms Appendix Ib. In the event of tipping proceeding over the survey area the following points should be taken into consideration regarding the archaeological remains:
  - 4.3.1 Feature **3.30**, 'Quarrybank' quarry manager's house. The site is heavily overgrown by rhodedendrons, which are threatening the preservation of the site. This problem is due to be addressed by the clearance of the rhodedendrons during 1998. Given the importance of the site it should ideally be preserved *in situ*, and its current condition stabilised by consolidation work to prevent further damage. Preservation should be achieved by exclusion of the property and its associated outbuildings and surrounding walls from the area of proposed tipping. Tipping should come no closer than 25 metres to the site. In the event of tipping proceeding over the site the following strategy should be adopted:

Detailed survey and recording in advance of destruction. The house itself is in too ruinous a state to withstand burial beneath a tip. Detailed investigation and recording of the site was beyond the scope of the current assessment, and besides, the site is too overgrown to enable access to some areas. It is proposed that following clearance of the rhodedendrons, a detailed photographic record using rectified photography should be made of all elevations and features of both the main building and its outhouses. Interpretative drawings should be prepared from the photographs. A report should be prepared documenting the results of the survey.

- 4.3.2 Feature **3.29**, Maenofferen quarry barracks. Again, given the stated importance of the site it should ideally be preserved *in situ*, and its current condition stabilised by consolidation work to prevent further damage. Preservation should be achieved through exclusion of the property from the area of proposed tipping. Tipping should come no closer than 25 metres to the site. In the event of tipping proceeding over the site the following strategy should be adopted:

A detailed photographic record using rectified photography should be made of all elevations and features of the building. Interpretative drawings should be prepared from the photographs. A report should be prepared documenting the results of the survey.

- 4.3.3 Features **3.18**, **3.20**, **3.25**, **3.28** and **3.29**; namely the tramway, aqueduct and ancient holloways. It is not considered that any of these features justify amendment of tipping areas in their own right. However, when viewed together, and in conjunction with Quarrybank house and the Maenofferen barracks, a strong case may be made for modifications to be made to the proposals. As a whole, the group of features produces a compact, yet diverse relict landscape amidst the more recent workings which surround it. It retains key elements of the industry's historic infrastructure. The presence of the Rhiwbach incline adds a further dimension to the distinctiveness of the area. Aspects of the pre-quarrying landscape are drawn out by the braided holloways (**3.29**) which runs through the north-west section of the survey area.

- 4.3.4 The following modifications to the tipping strategy for Area O and Area P/Archaeological Survey Area Three are suggested:

- 4.3.4.1 Evidently the best case scenario for the preservation of the historic character of Archaeological Survey Area Three would be to leave the whole area free from tipping. However, it is obviously necessary to reach a balance between safe-guarding the archaeological remains and the expediencies of present and future quarrying operations. It is proposed that tipping extends no further than the edge of a 20 metre wide buffer-zone, tapered to 5 metres at the top, either side of the Rhiwbach incline. This should be extended to include the eastern half of the tramway shown as feature **3.18**.
- 4.3.4.2 In terms of the archaeology remains this would result in the loss through burial of part of feature **3.18** and the whole of feature **3.20**, **3.29** and the line of the aqueduct shown as feature **3.25** and **3.28**. It would however, ensure the preservation of part of the line of the tramway and of Quarrybank and the Maenofferen barracks.

## **5 Archaeological survey area four**

- 5.1 Just under half of this area is occupied by the flooded main pit of the Votty quarry.
- 5.2 A single feature, depicted on plan **LLECH.97.ARC04**, was recorded for the entire survey area. This consists of a stone built causeway which is approximately 30m long, 3m wide and 4m high at its greatest extent. It probably functioned to raise the water holding capacity of the quarry following its flooding as a source of water for the Bowydd quarry (Richards 1991, 126).
- 5.3 It is suggested that the land covered by this survey area could be used as a tipping site, thereby taking some of the pressure away from Area O/Archaeological Survey Area Three. Extensive tipping has already buried the focus of the Votty quarry, without which the pit has lost its historical significance.

## **6 Archaeological survey area five**

### *Gazetteer of feature descriptions*

- 6.1 Despite comprising a substantial area of land, only two features of archaeological significance were located. The ground is predominantly water-logged despite the presence of numerous drainage cuts and channels. It is only really of use for rough upland grazing.
- 6.2 The location of the features is fixed on plan **LLECH.97.ARC06**.
  - 6.1 Poorly defined, vegetated trackway leading northwards, probably to peat cuts beyond the survey area.
  - 6.2 Area of possible peat cutting.

### *Recommendations*

- 6.3 There are no archaeology based objections to the proposed tipping over Archaeological Survey Area Five. of this area.

## 7 General recommendations

- 7.1 Obviously, this report only covers the above-surface archaeology of the areas surveyed. Buried sites may well remain undetected. It is recommended that when topsoil is removed from an area, machine operators should be primed to report the findings of any potential archaeological remains to someone who is able to make a provisional assessment of their significance before work resumes. The discovery of buried archaeological remains should be reported to the County Archaeologist (or equivalent) or to the county Sites and Monuments Records Officer for comment.
- 7.2 A copy of the archaeological content of this report, a duplicate set of the photographic record, and any archaeological information generated by the implementation of recommendations outlined in this report should be lodged with the Sites and Monuments Record maintained by the Gwynedd Archaeological Trust.

## 8 References

- Crew, P and Musson, C (1996) *Snowdonia from the Air* Penrhyndeudraeth: Snowdonia National Park Authority.
- Isherwood, JAG (1988) *Slate from Blaenau Ffestiniog* A.M. Publishing.
- Manley, J (1991) Archaeological assessment conducted at Llechwedd Slate Mines, Blaenau Ffestiniog Unpublished report.
- Richards, A J (1991) *A Gazetteer of the Welsh Slate Industry* Gwasg Carreg Gwalch.

## 9 Acknowledgements

I am very grateful to Kathryn Geary, SMR officer for Gwynedd and to Steffan ab Owain, archivist at Caernarfonshire Record Office for providing me with help and information.

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Archaeological survey areas

Notation :



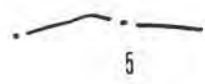
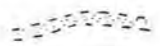
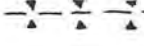
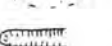
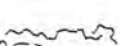
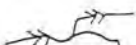
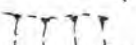
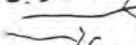
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- Permitted area of surface tipping
- Permitted area of surface working
- Archaeological survey areas

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Scale : 1 : 10,000

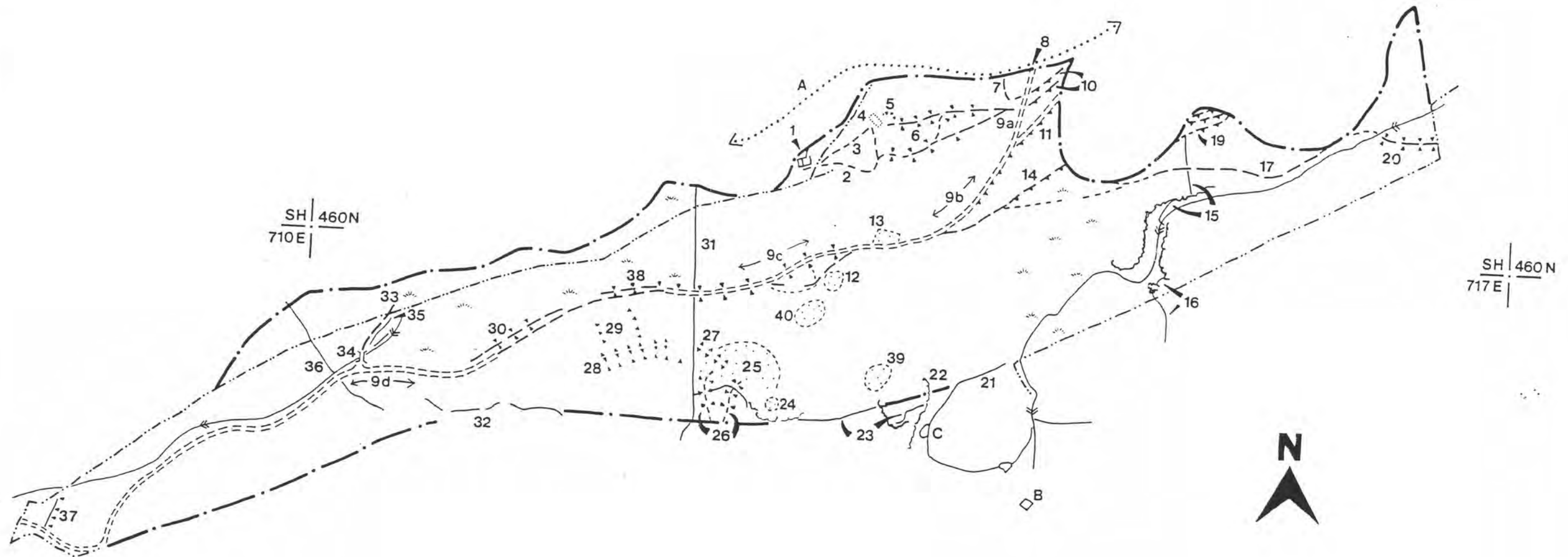
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Amendments :

|                                                                                     |                                                                                 |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
|    | boundary of survey area<br>feature reference numbers                            |
|    | building remains                                                                |
|    | possible building remains                                                       |
|    | modern trackway                                                                 |
|    | well defined trackway or path                                                   |
|    | holloway                                                                        |
|    | terraced trackway or path                                                       |
|    | bank                                                                            |
|    | ditch                                                                           |
|    | water-logged ground                                                             |
|    | peat cut                                                                        |
|   | area of eroded peat cuts                                                        |
|  | quarry cut or prospection level                                                 |
|  | rock out-crops and cliff faces                                                  |
|  | slate waste tip                                                                 |
|  | wall                                                                            |
|  | stile                                                                           |
|  | sheep through                                                                   |
|  | modern fence-line                                                               |
|  | stream                                                                          |
|  | stream gullies                                                                  |
|  | drainage ditch                                                                  |
|  | bridge                                                                          |
|  | area of dense rhododendron cover<br>(where presents impediment to<br>surveying) |



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Archaeological survey area 1

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SH 722E | 465N

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Archaeological survey area 2

Drawing no. : LLECH.97.ARC03

Scale : 1 : 2,500

Date : January 1998

Amendments :



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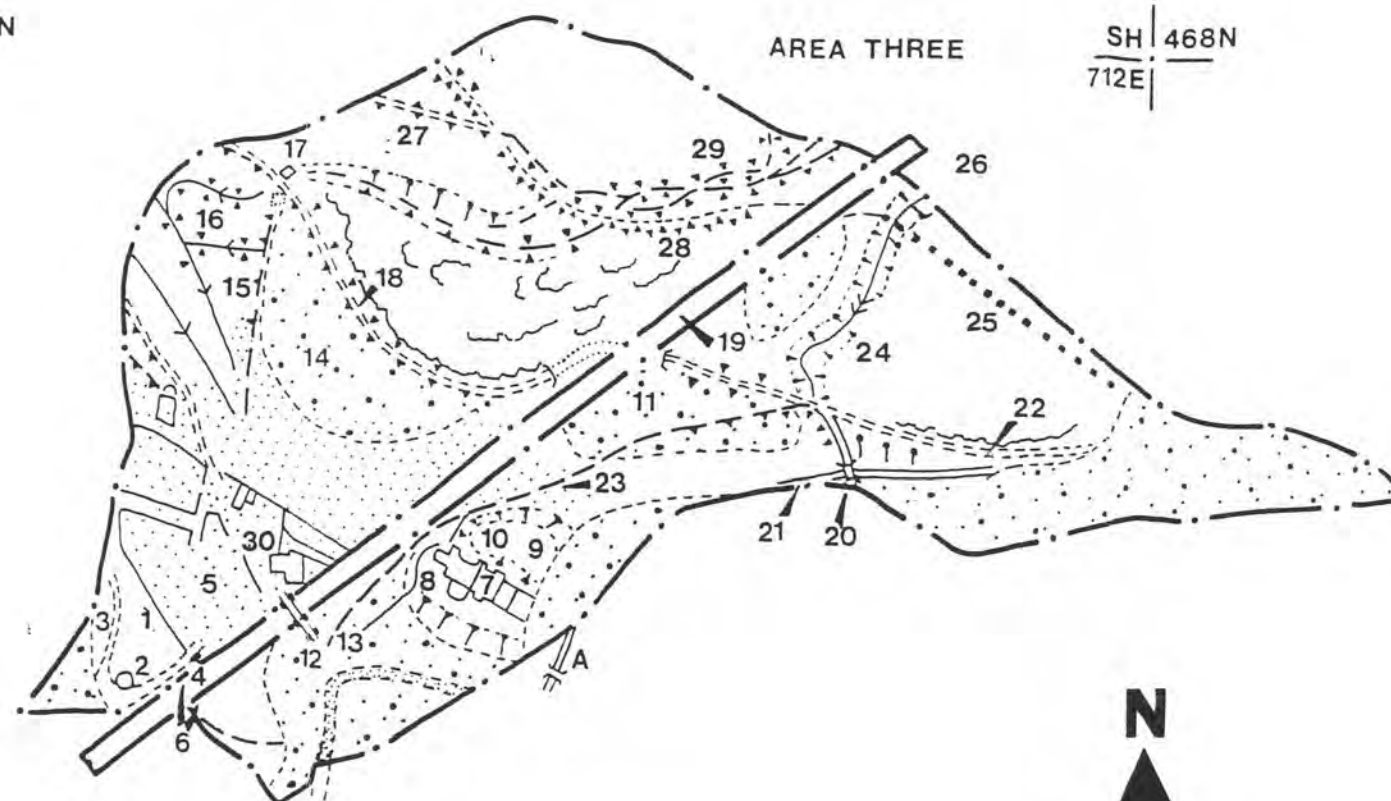


AREA FOUR

SH 468N  
708E

AREA THREE

SH 468N  
712E



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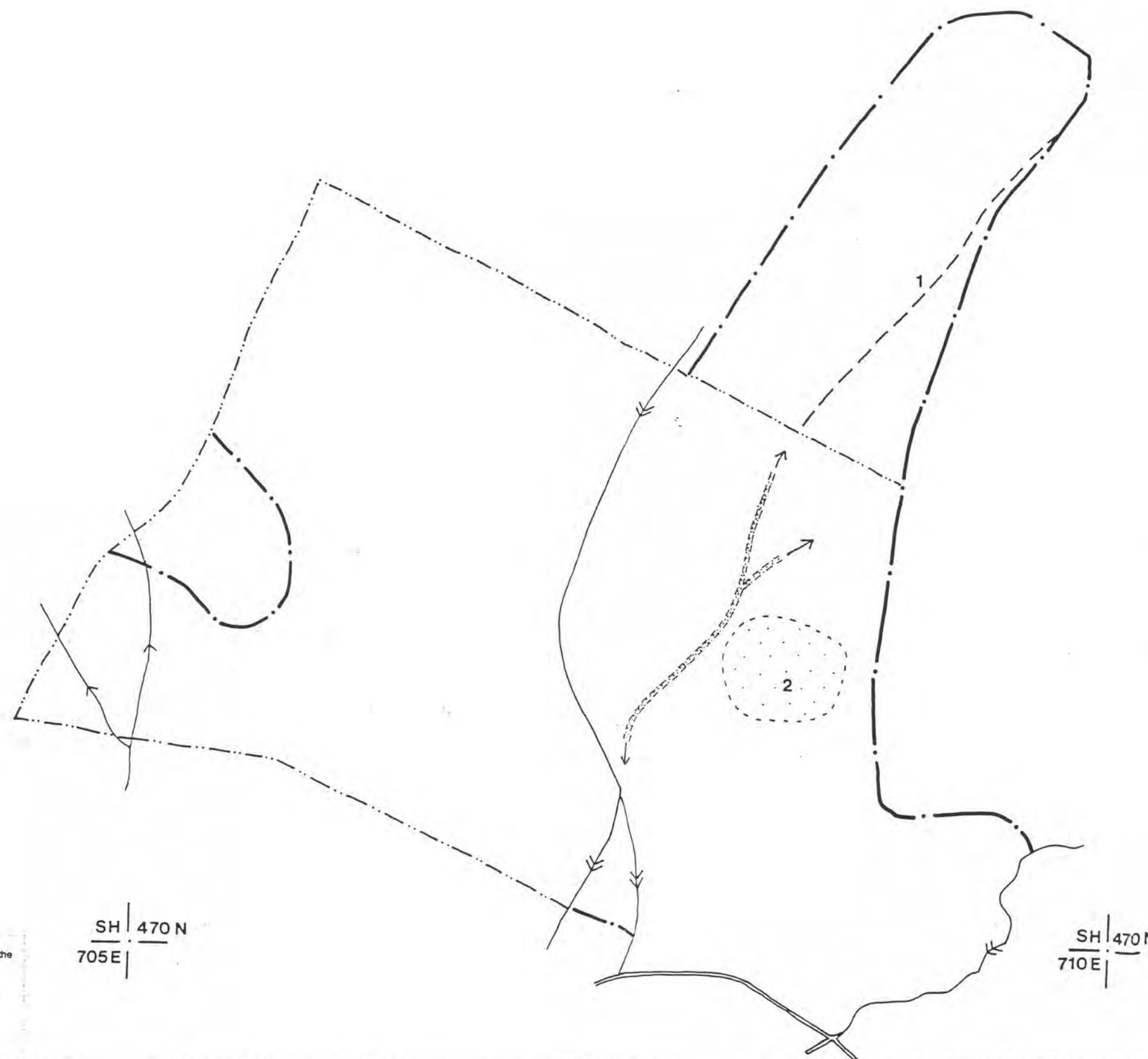
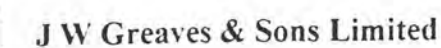
Archaeological survey area 3 and 4

Drawing no. : LLECH.97.ARC04

Scale : 1 : 2,500

Date : January 1998

Amendments :



AL 51280A0001

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$$\begin{array}{r|l} \text{SH} & 470 \text{ N} \\ \hline 710 \text{ E} & \end{array}$$

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**Archaeological survey area 5**

Drawing no. : LLECH.97.ARC05

Scale : 1 : 2,500

Date : January 1998

**Amendments :**

## **Appendix 2**

### *Phase 1 Habitat Survey*

## **Llechwedd Slate Mines operation plan - habitat survey**

The survey was undertaken using the standardised methodology of the Joint Nature Conservation Committees' Phase 1 habitat survey (JNCC, 1993). This methodology is a standardised system for classifying and mapping wildlife habitats in all parts of Great Britain. It involves mapping units of land and assigning them to a nationally recognised classification in which each habitat type has a recognised name, number and colour coding.

A habitat survey was undertaken during July 1997 of two areas of land which are proposed for future tipping in the Llechwedd and Maenofferen sections of the mine. The results of this survey can be seen in the survey areas shown on drawing number LLECH.97.HAB1 and LLECH.97.HAB2 and the habitat types found are listed with commentary in appendix 1 below.

A full list of plant species recorded during the survey can be seen in the appendix to this report. No species of particular merit were recorded and the vegetation types found in the survey area are all typical of upland Snowdonia and well represented in the surrounding area. The reduction of the grazing pressure in the survey area shown on LLECH.97.HAB1 has resulted in vegetation, particularly in the northern section that is a fairly good representation of its type. Wet heaths and dry heaths are listed in the annex of the European directive on wildlife habitats (referred to as the habitats directive) as habitats of European importance which should be maintained in favourable conservation status. Therefore consideration should be given to the mitigating for the loss of this internationally important, albeit small, area of heathland habitat. The most appropriate way to mitigate for this loss of heathland habitat would be to place another area of land in the ownership of Llechwedd under positive management for heather. This could be achieved largely through the control of sheep grazing. Heavy grazing by sheep favours the more resistant grass species such as mat grass but after a reduction in grazing pressure heath species such as common heather, heath and bilberry quickly recover, particularly if there is still a significant proportion of these species remaining in the sward.

**Appendix 1** A description of the habitat types found during the survey of the two areas proposed for future tipping in the Llechwedd mine area

| Code | habitat name                      | habitat description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A2.1 | dense/continuous scrub            | This habitat code has been used for areas of dense rhododendron ( <i>Rhododendron ponticum</i> ), a non native invasive species. This species, which spreads rapidly and often forms a dense impenetrable scrub and results in the exclusion of all other species, is a problem in the Snowdonia National Park and efforts are taken to control it. The control of this species in areas that are not going to be tipped on is recommended so that the species does not interfere with any landscape and wildlife habitat mitigation plan proposed for the mines.                                                                                                                |
| A2.2 | scattered scrub                   | Scattered and non continuous cover of rhododendron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| A3   | parkland and scattered trees      | Over mature non native conifers and several ash ( <i>Fraxinus excelsor</i> ) trees are present in an abandoned garden of a ruined quarry cottage. These trees have a dense understorey of rhododendron and are of little interest to nature conservation in themselves although they add to the habitat diversity of the area. If they are felled or damaged by tipping then consideration should be given to the planting of native trees and shrubs at the bottom edges of the new tips.                                                                                                                                                                                       |
| B1.2 | semi-improved acid grassland      | This habitat code describes hill grazing land on acidic soils of less the pH5.5. It is species poor and grades into wet and dry dwarf shrub heath. In both survey areas it is dominated by wavy hair grass ( <i>Deschampsia flexuosa</i> ), mat grass ( <i>Nardus stricta</i> ), heath bedstraw ( <i>Galium saxatile</i> ), and heath rush ( <i>Juncus squarrosus</i> ). This habitat type is common in upland Snowdonia and is of little interest for nature conservation.                                                                                                                                                                                                      |
| B5   | marshy grassland                  | Marshy grassland is a diffuse category and which has been assigned to two areas in drawing number LLECH.97.HAB1. The first area is dominated by purple moor grass ( <i>Molinia caerulea</i> ) which grades into wet heath and acid grassland to the north and acid grassland to the south. The second area is a strip of vegetation which follows the line of a drain which is dominated by sharpened flowered rush ( <i>Juncus acutiflorus</i> ) and soft rush ( <i>Juncus effusus</i> ) together with wavy hair grass and purple moor grass.                                                                                                                                   |
| D5   | dry heath / acid grassland mosaic | This habitat is found on the free draining slope to the west of the incline of drawing number LLECH.97.HAB2. Bilberry ( <i>Vaccinium myrtillus</i> ) is frequent in amongst mat grass and wavy hair grass, and common heather ( <i>Calluna vulgaris</i> ) and dry heath ( <i>Erica cinera</i> ) can be found on the rock outcrops and ledges which are less accessible to sheep.                                                                                                                                                                                                                                                                                                 |
| D6   | wet heath / acid grassland mosaic | A complex mosaic of wet heath and acid grassland occurs in the northern end of drawing number LLECH.97.HAB1. The vegetation is dominated by wavy hair grass, bilberry, common heather, wet heath ( <i>Erica tetralix</i> ). Sheep have been prevented from grazing this area for the last 12 months or so and as a result heath species growth is more luxuriant than in many places in upland Snowdonia where grazing pressure is usually heavy. This habitat grades in to acidic flushes in areas associated with water movement. The relative proportions of each habitat in this area are approximately 40:50:10 of wet heath, acid grassland and acidic flush respectively. |
| E2.1 | acidic flush                      | This habitat is associated with water movement and occurs on gently sloping ground. As the flushes are acidic they are species poor with a ground layer dominated by Sphagna and other bryophytes together with soft rush.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| G2.3 | Oligotrophic stream               | The stream running alongside survey area 1 is typical of upland running waters with acidic, nutrient poor, clean water. No plant life was recorded in the stream.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| J3.6 | buildings                         | There are two derelict buildings in drawing number LLECH.97.HAB2. Around the building to the east of the incline there are patches of nettles ( <i>Urtica dioica</i> ), an indicator species of nutrient enrichment of the soil and disturbed ground. The building to the west of the incline has an abandoned garden with mature trees and an understorey of rhododendron. The presence of the trees may make this building a suitable habitat for bats, however there have been no recordings of sightings of bats around these buildings or in the Llechwedd mine area.                                                                                                       |

**Appendix 2** Target notes to accompany the phase 1 habitat maps shown in drawing number LLECH.97.HAB1

| Target note number | description                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                  | Drainage channel with around 5m strip of marshy grassland<br>Species: <i>Juncus</i> (cf) <i>acutiflorus</i> , <i>J. effusus</i> , <i>Carex nigra</i> , <i>Festuca ovina</i> , <i>Agrostis stolonifera</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Galium saxatile</i> , <i>Potentilla erecta</i> and <i>Caltha palustris</i> |
| 2                  | Rocky outcrop with <i>Ulex</i> spp, <i>Erica cinerea</i> and <i>Sedum anglicum</i>                                                                                                                                                                                                                                                                |
| 3                  | Wet heathland and acid grassland mosaic with areas of acid flush dominated by <i>Juncus effusus</i> and <i>Sphagna</i> . Proportions of each 40:50:10 respectively.                                                                                                                                                                               |
| 4                  | Dry heath and acid grassland mosaic, with <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and <i>Nardus stricta</i> . <i>Calluna vulgaris</i> and <i>Erica cinera</i> occur on rock outcrops which are less accessible to sheep. Proportion of wet heath to acid grassland approximately 20:40 respectively                                 |

**Appendix 3** Species recorded in drawing number LLECH.97.HAB1

|                                       |                                   |
|---------------------------------------|-----------------------------------|
| <i>Agrostis stolonifera</i>           | <i>Juncus bulbosus</i>            |
| <i>Anthoxanthum odoratum</i>          | <i>Juncus effusus</i>             |
| <i>Calluna vulgaris</i>               | <i>Juncus squarrosus</i>          |
| <i>Caltha palustris</i>               | <i>Molinia caerulea</i>           |
| <i>Carex nigra</i>                    | <i>Nardus stricta</i>             |
| <i>Cladonia</i> sp                    | <i>Pleurozium schreberi</i>       |
| <i>Deschampsia flexuosa</i>           | <i>Polygala serpyllifolia</i>     |
| <i>Dicranum scoparium</i>             | <i>Polypodium</i> sp              |
| <i>Digitalis purpurea</i>             | <i>Polytrichum commune</i>        |
| <i>Erica cinerea</i>                  | <i>Potentilla erecta</i>          |
| <i>Erica tetralix</i>                 | <i>Rhytidiadelphus squarrosus</i> |
| <i>Eriophorum angustifolium</i>       | <i>Rumex acetosella</i>           |
| <i>Eriophorum vaginatum</i>           | <i>Sedum anglicum</i>             |
| <i>Festuca ovina</i>                  | <i>Sphagna</i> spp                |
| <i>Galium saxatile</i>                | <i>Ulex europaeus</i>             |
| <i>Holcus lanatus</i>                 | <i>Vaccinium myrtillus</i>        |
| <i>Juncus</i> (cf) <i>acutiflorus</i> |                                   |

**Appendix 4:** Species recorded in drawing number LLECH.97.HAB2

|                              |                                   |
|------------------------------|-----------------------------------|
| <i>Anthoxanthum odoratum</i> | <i>Pleurozium schreberi</i>       |
| <i>Athyrium filix-femina</i> | <i>Polypodium</i> sp              |
| <i>Calluna vulgaris</i>      | <i>Potentilla erecta</i>          |
| <i>Carex binveris</i>        | <i>Prunella vulgaris</i>          |
| <i>Cryptogramma crispa</i>   | <i>Deschampsia flexuosa</i>       |
| <i>Dicranum scoparium</i>    | <i>Rhododendron ponticum</i>      |
| <i>Digitalis purpurea</i>    | <i>Rhytidiadelphus squarrosus</i> |
| <i>Erica cinera</i>          | <i>Sedum anglicum</i>             |
| <i>Festuca ovina</i>         | <i>Ulex</i> sp                    |
| <i>Galium saxatile</i>       | <i>Urtica dioica</i>              |
| <i>Juncus squarrosus</i>     | <i>Vaccinium myrtillus</i>        |
| <i>Nardus stricta</i>        |                                   |

NB: These species were recorded as part of a phase 1 survey and therefore are unlikely to be fully comprehensive



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Conduit

D6/E2.1

B5

Drain

B5

B1

B1

Drain

Tip  
(dis)

I2

Drain

Quarry  
(disused)

Sheepfold

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Environmental

Title

Phase 1 Habitat survey map

Notation :  Survey area

  
NORTH

Drawing no. : LLECH.97.HAB1

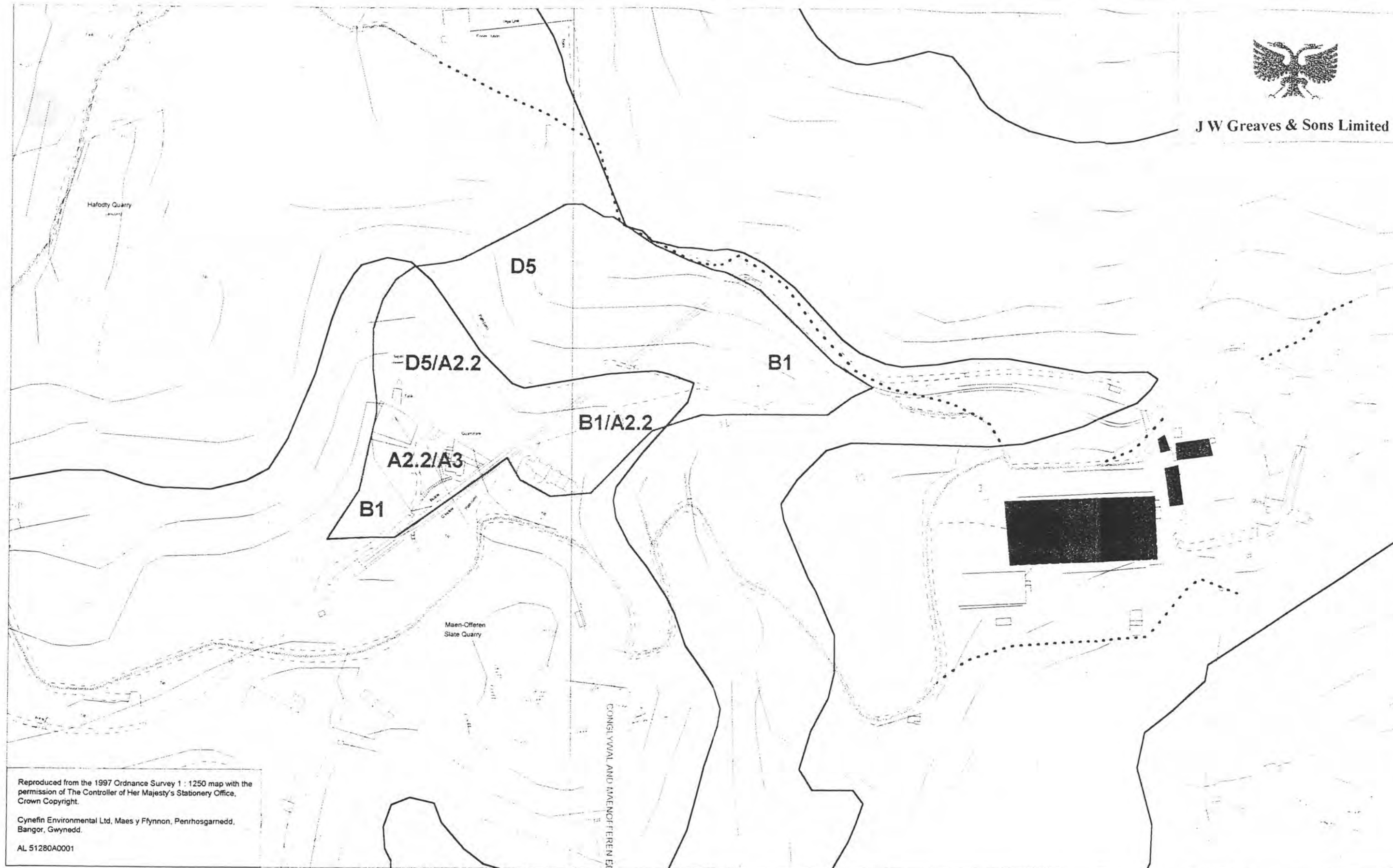
Scale : 1 : 2500

Date : January 1998

Amendments :



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*Cynefin*  
Environmental

Title

Phase 1 Habitat survey map

Notation :  Survey area

  
NORTH

Drawing no. : LLECH.97.HAB2

Scale : 1 : 2500

Date : January 1998

Amendments :