LLANBRYNMAIR WIND FARM

Supplementary Environmental Information

August 2013

Volume II – A - Supporting Appendices

power for good

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APPENDIX 1.1: CALCULATION OF HOMES SUPPLIED AND POLLUTION SAVED BY LLANBRYNMAIR WINDFARM

1.1 Introduction

1.1.1 The method used to calculate homes supplied and pollution savings at the proposed Llanbrynmair windfarm, is based on that used and supported by RenewableUK as industry standard seen at: http://www.renewableuk.com/en/renewable-energy/wind-energy/uk-wind-energy-database/figures-explained.cfm

1.2 Households Supplied

1.1.2 To calculate the number of households whose annual electricity demand would equal the output of the proposed Llanbrynmair windfarm, the following equation has been used:

$$\text{Number of Households} = \frac{\text{Installed Capacity (kW)} \times 0.3 \times 8{,}760}{4{,}266}$$

1.1.3 Where:

- the installed capacity of Llanbrynmair windfarm is nominally 60MW, or 60,000kW, this is 30 turbines each of 2.0MW capacity;
- 0.3 (i.e. 30.0%) is the mean load factor that takes into account the fluctuating nature of the wind, and various loss mechanisms (e.g. wakes and electrical transmission);
- 8,760 is the number of hours in a year;
- 4,266kWh is the average UK household electricity usage per year (Figures taken from http://www.renewableuk.com/en/renewable-energy/wind-energy/uk-wind-energy-database/figures-explained.cfm).

$$\text{Homes Supplied} = \frac{60{,}000 \times 0.3 \times 8760}{4{,}266} = 36{,}962 \text{ homes}$$

1.1.4 In summary, the Llanbrynmair windfarm would produce enough electricity to supply 36,962 homes.

1.1.5 In Powys there were 58,345 occupied households in 2011.

Percentage of households served:

= 100 x (36,962 / 58,345) = 63% of homes in Powys.

1.1.6 Household figures taken from: Census 2011 Neighbourhood Summary Statistics page for Powys, total for households taken from Housing summary section http://neighbourhood.statistics.gov.uk

1.1.7 In summary, the Llanbrynmair windfarm would supply the equivalent of nearly two thirds of the homes in Powys.

1.1.8 Should a 2.3MW or 3MW model be available within the specifications submitted within the planning application Llanbrynmair windfarm would supply the equivalent of 42,506 (73%) or 55,443 (95%) of Powys homes respectively.

1.3 Pollution Savings

1.1.9 Every unit (kilowatt-hour, kWh) of electricity produced by the wind displaces a unit of electricity that would otherwise have been produced by a power station burning fossil fuel.

1.1.10 For each unit of electricity generated by Llanbrynmair windfarm, savings would be made of 430g CO_2 and small amounts of other pollutants (Figures taken from RenewableUK, 2013).

1.1.11 To calculate pollutants saved by the windfarm the following equation has been used:

> Annual CO_2 Emissions Reductions (in tonnes):
>
> = (A x 0.3 x 8,760 x 430) /1,000 = 67,802 tonnes.

1.1.12 Where:

- A is the rated capacity of the wind energy development in MW i.e. 60MW;
- 0.3 (i.e. 30.0%) is the mean load factor that takes into account the fluctuating nature of the wind, and various loss mechanisms (e.g. wakes and electrical transmission);
- 8,760 is the number of hours in a year.

1.1.13 In summary, the Llanbrynmair windfarm would provide annual CO_2 emissions reductions equivalent to 67,802 tonnes CO_2.

1.1.14 Over the proposed 25 years of windfarm operation this would amount to 1.7 million tonnes CO_2.

1.1.15 Should a 2.3MW or 3MW model be available within the specifications submitted within the planning application Llanbrynmair windfarm would provide annual CO_2 emissions reductions equivalent to 77,973 tonnes CO_2 or 101,704 tonnes CO_2 respectively.

1.1.16 Over the proposed 25 years of windfarm operation this would amount to 1.9 million tonnes CO_2 or 2.5 million tonnes CO_2.

APPENDIX 1.2: ORIGINAL ES SCOPING CHECKLIST AND SCOPING OPINION

1.1 Environmental Statement Scoping Checklist

1.1.1 The scope of the environmental assessment would be as follows:

Section 1: Introduction

- The Application;
- The Applicants;
- Rationale and Need for the Project: Includes a discussion of the greenhouse gases and climate change;
- Energy Payback;
- The Renewable Energy Resource;
- International, EC, UK and Welsh Policy on Renewable Energy;
- The Renewables Obligation;
- Regional Renewable Energy Resource and Regional Targets for Renewable Energy;
- The Environmental Impact Statement: Describes the environmental assessment process, methodology used and structure of the EIS. The significant effects approach;
- Public Attitudes;
- Consultations: describes individuals and organisations consulted.

Section 2: Site Selection

- Introduction and location of search;
- Identification of potential sites and their ranking Preliminary consultation and site visits Commitment to progression of site;
- Summary.

Section 3: Description of the Project

- Site Description: Location, topography and landuse, designations, wind resource etc.;
- The Proposed Development: Site layout and design evolution, land use requirements, anemometer masts, the wind turbines, substation and control building, grid connection, main road access, on site access tracks;
- Construction: Construction program, site access tracks, crane outrigger pads, foundations, temporary works, cabling, substation and control building, materials and transport, pollution control measures, workforce;
- Reinstatement: Site access tracks, turbine bases, other areas;
- Operation and Maintenance: Operational features, transport, workforce;
- Decommissioning.

Section 4: Landscape and Visual Assessment

1.1.2 (This study would be undertaken by an independent consultant). A 25km study area around the wind farm will be considered. Section to consist of:

- **Introduction, Methodology** (reference made to current best practice guidelines) **and Consultations;**

- **Baseline:** Landscape character and designations would be considered;
- **Assessment of Effects:** Approximately 10 viewpoints would be selected of short, medium and long distant views from representative locations. List to be agreed with Local Planning Authority. Wirelines would be produced from each viewpoint and a photomontage produced for up to 4 of the key viewpoints. *[Please suggest a draft list of viewpoints within the scoping opinion response which the local authority wishes to see selected as viewpoints for the assessment];*
- Photographs would be taken using a 50mm lens as recommended best practice by the Landscape Institute;
- **Mitigation Measures;**
- **Conclusion and Summary of Effects:** A cumulative visual assessment will be undertaken of any existing or consented wind farms (as of the date the scoping opinion is received by RES) within the 25km study area around the proposed RES wind farm.

Section 5: Ecological Assessment (Flora and Fauna)

1.1.3 (This study would be undertaken by an independent consultant). Section to consist of:

- **Introduction, Methodology** (reference made to current best practice guidelines) **and Consultations;**
- **Baseline;**
- **Assessment of Effects;**
- **Mitigation Measures;**
- **Conclusion and Summary of Effects:** The assessment would include a breeding and wintering bird survey and phase I habitat survey. Surveys would be carried out to specifically address potential honey buzzard populations in the area using an RSPB approved ornithologist specialising in this species;
- Surveys would be carried out overlooking Banwen Farm pond to address migrating wildfowl species.

Section 6: Cultural Heritage Assessment

1.1.4 (This study would be undertaken by an independent consultant). Section to consist of:

- Introduction, Methodology and Consultations;
- Baseline;
- Assessment of Effects;
- Mitigation Measures;
- Conclusion and Summary of Effects: The assessment will include a desk based assessment and if considered necessary a one day walk over field visit.

Section 7: Hydrological Assessment

1.1.5 (The hydrological assessment would be undertaken by an independent consultant). Section to consist of:

- Introduction, Methodology and Consultations;
- Baseline;
- Assessment of Effects;
- Mitigation Measures;

- Conclusion and Summary of Effects: The assessment will include a desk based assessment and if considered necessary a one day walk over field visit.

Section 8: Noise Assessment

1.1.6 (undertaken by RES's own noise team)

- **Introduction, Methodology** (reference made to British Standards, DTI Noise Working Group 1997 ETSU;
- report and relevant PPGs etc.) **and Consultations;**
- **Baseline environment Impact assessment Mitigation measures;**
- **Conclusion and Summary of Effects:** Conclusions regarding the significance of the resulting effects of the operational wind farm development on the noise environment would be assessed. Taking into account current guidelines and planning conditions.

Section 9: Transportation and Access

- Introduction, Methodology and Consultations;
- Existing road conditions of the proposed site and access route – baseline:
    - The roads which will be used for construction and operation purposes would be assessed within the EIS. The structure and strength of the route would be looked at as well as considering any alternative routes;
    - This would be done through site investigations to examine the route and in collaboration with the local highways authority to establish road strength and safety issues such as visibility splays;
    - Utilities (BT, Electric, Water, Transco) to check locations of cables/pipes etc.;
- Impact assessment:
    - The number and type of construction, operation and decommissioning traffic movements would be determined. Once this is established this would be assessed against the available access routes to the proposed site;
    - Any traffic management measures which would be required to ensure the safety of other road users would be examined;
    - Any road improvements, upgrading necessary would be examined and technical scale drawings would be prepared;
    - Driver distraction would be examined through an examination of evidence from existing wind farms in the UK;
- Mitigation Measures:
    - The preferred route would be chosen and any mitigation measures which are seen necessary by the local highways authority would be agreed;
    - Alternative routes to the site and on to the site would be examined and the route which minimises environmental, disturbance and technical problems would be chosen;
- Conclusion and Summary.

Section 10: Electromagnetic Interference

- Introduction and Methodology;
- Consultations: With the appropriate bodies to whom electromagnetic interference may be a problem would be carried out. The possible problems which could occur would be explored such as interference with television reception, microwave communications and air traffic safeguarding;

- Impact Assessment: Consultation would lead to greater knowledge of existing links and transmitters and the requirement of mitigation measures to offset any disruption. Investigation would be undertaken to examine any potential problems with interference and ways to minimise interference through site layout;
- Mitigation Measures: Arrangements with the telecommunications and transmitting companies would be finalised to cover any costs necessary for any mitigation measures necessary;
- Conclusion and Summary.

Section 11: Socio-Economic Assessment

- Introduction, Methodology and Consultations;
- Existing socio-economic conditions of the proposed site area – baseline:
    - The existing socio-economic situation should be described within the environmental statement. To include nearest settlements, dwellings and population numbers;
    - Identify any existing public rights of way and recreational uses within and surrounding the site;
- Impact assessment:
    - The economic benefits which would accrue to the local community and area both directly and indirectly would be examined. Employment created by wind energy.
    - Safety and Recreation: Turbine safety, RES safety procedures, Tourism and education, Public rights of way, Public safety, Risk assessment.
- Mitigation Measures;
- Summary and Conclusion.

Section 12: Summary of Effects

1.1.7 The definition of significance according to EIA Regulations. A summary table showing a summary of all environmental effects.

- REFERENCES;
- GLOSSARY/ABBREVIATIONS;
- TECHNICAL APPENDICES.

Structure of the Environmental Statement

1.1.8 The ES would be produced in three volumes:

- **Volume I:** Non Technical Summary - would be available free of charge to interested groups and individuals, and would be written in English and Welsh;
- **Volume II:** Environmental Statement including technical appendices;
- **Volume III:** Figures and Photomontages.

1.1.9 A separate Planning Policy Statement to discuss whether the wind farm is in accordance with the Development Plan and other material considerations, taking into account the findings of the EIA. This would be prepared and submitted with the ES and planning application as a separate document in support of the application.

APPENDIX 1.3: LIST OF ORGANISATIONS CONTACTED

1.1.1 A full list of bodies contacted to date by RES on the Llanbrynmair windfarm proposal is as follows:

- Arqiva;
- DECC (Department for Energy and Climate Change; formerly Department for Business Enterprise and Regulatory Reform [BERR] and formerly Department for Trade and Industry [DTI]);
- British Broadcasting Corporation (BBC);
- British Telecommunications (BT) Wholesale;
- Cable and Wireless;
- Cadw;
- Civil Aviation Authority (CAA);
- Clwyd Powys Archaeological Trust;
- CSS Spectrum Management Services Ltd;
- Defence Estates;
- Dŵr Cymru Welsh Water;
- Dyfnant and Vyrnwy Horse Riding and Carriage Driving Association;
- Joint Radio Company;
- Montgomeryshire Wildlife Trust;
- MLL Telecomms;
- National Grid Transco;
- National Grid Wireless Group;
- National Transcommunications Ltd (NTL);
- Natural Resources Wales (NRW; formerly Countryside Council for Wales [CCW], Environment Agency Wales [EAW] and Forestry Commission Wales [FCW]);
- Powys County Council;
- OFCOM;
- Orange;
- The Royal Society for the Protection of Birds (RSPB);
- Snowdonia National Park Authority;
- T-Mobile UK.

1.1.2 Further organisations have been consulted directly or in more detail by the environmental consultants undertaking the various assessments for this SEI and these are detailed within the relevant sections of the SEI package.

APPENDIX 1.4: SCOPING CONSULTATION RESPONSES

Simon Peltenburg

From: Mohammed Gary (Mr A) ERDU []
Sent: 09 March 2006 10:12
To: Simon Peltenburg; Steve Packer (E-mail); David Ladd (E-mail)
Subject: Garreg Lwyd Hill and Llanbrynmair windfarms

Simon cc Steve, David

Thank you for your EIA scoping requests for the above mentioned windfarms. I note that these may be above 50MW and therefore fall to the DTI to determine under section 36 of the Electricity Act 1989. On that basis my initial view is that the EIA should consider the cumulative impact of all windfarms and proposals within a 30 km radius. By that I mean those windfarms that are built, consented or a planning application has been submitted. For the avoidance of doubt the Department considers the 30km radius to be from the boundaries of the sites and not the centres. This is consistent with other scoping opinions.

You should also include site selection including other sites considered and why they were rejected.

Also could you include an assessment for transporting the turbines and blades by water as well as by road. I am aware that this will depend on who the supplier(s) are but it would be helpful to know where the turbines/blades would be landed and the road journey from the port to the sites

Steve/David - grateful if you could provide me with details of the windfarms in your areas.

Regards

Gary

Gary Mohammed
Manager, Power Station and Pipe-line Consents
Room 2121, 1 Victoria Street
London SW1H 0ET

tel no: 020 7215 2880
fax no: 020 7215 2601
email: gary.mohammed@dti.gov.uk

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CADEIRYDD/CHAIRMAN: JOHN LLOYD JONES OBE
Anfonwch eich ateb at/Please reply to: Ken Perry
Ffôn/Tel: 01686 613400/01597 827415
Ffacs/Fax: 01686 629556
Ebost/Email: k.perry@ccw.gov.uk

PRIF WEITHREDWR/CHIEF EXECUTIVE: ROGER THOMAS
Rhanbarth De a Dwyrain / South & East Region
Y Llawr Cyntaf / First Floor
Ty Ladywell / Ladywell House
Stryd y Parc / Park Street
Y DRENEWYDD / NEWTOWN
Powys
SY16 1RD

Renewable Energy Systems UK Limited
Beaufort Court
Egg Farm lane
KINGS LANGLEY
Herts
WD4 8LR

Ein cyf/Our ref:KAP//SH90/planning
Eich cyf/Your ref: 01592L00086

22 September 2006

For the attention of Simon Peltenberg

Dear Simon

LLANBRYNMAIR SOUTH WINDFARM SCOPING CHECKLIST: OPINION REQUEST.

Thank you for your letter of the 21 June 2006, following on from our previous advice on the 31 March 2006. Please accept my sincere apologies for the time lag that it has taken for the Countryside Council for Wales (CCW) to respond.

In discharging its functions under Section 130 of the Environmental Protection Act 1990 the Countryside Council for Wales (CCW) champions the environment and landscapes of Wales and its coastal waters as sources of natural and cultural riches, as a foundation for economic and social activity, and as a place for leisure and learning opportunities. CCW aims to make the environment a valued part of everyone's life in Wales.

The Environmental Impact Assessment (EIA) for this development should include sufficient information to enable the planning authority to determine the extent of any environmental impacts arising from the proposed scheme on protected species and other nature conservation, countryside and landscape interests.

Our detailed comments in relation to the scoping requirements are included in the attached Annex 1, which is based on the standard items that CCW considers need to be taken into account when producing an EIA for windfarm developments.

CCW consider that overall the scoping report covers all those areas that we think should be covered within an EIA. Nevertheless, CCW would like to make the following general comments in relation to the proposals:

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Countryside Council for Wales

- It is noted that the proposed development site lies within the Llanbrynmair Strategic Search Area (SSA B). I assume that the wind turbines will be on the higher ground, but the consultation boundary on your map does not agree entirely with the refined boundary presented in Powys County Council Draft Interim Development Control Guidance: Onshore Windfarm Developments 2006.
- Whilst we appreciate that policy supports the location of large scale (>25MW) developments within the SSAs we must emphasise that any such development still has to be considered on its merits with respect to ecology and landscape. It must also be considered in the context of similar development proposals, both within the SSAs and outside, and the potential cumulative impacts associated with them. CCW has already responded to Enviros on the landscape and visual assessment (copy attached as Annex II), where we noted that a few of the turbine locations appeared to be outside this refined area in the North East corner.
- Reference to TAN 8 has been made in the scoping report, but CCW would expect to see reference to the other guidance listed under section 2 of the attached Annex 1 in the final Environmental Statement.
- New power lines and highway access may well be required as part of the development, and CCW would wish to see these included within the EIA;we note that the scope does propose to assess transportation impacts (Section 9). This may involve road widening and associated hedge removal and other impacts.
- There are no statutory wildlife sites (existing or proposed) within the consultation boundary, as confirmed previously in response of 31March 2006.
- CCW are aware that bird survey is already ongoing, and that once results are written up you will be discussing them with CCWs Senior Ornithologist (Sian Whitehead) and RSPB.
- There are at least two Tir Gofal agri-environment scheme agreements within the site boundary provided (one in the NE and the other in the SW part). Although Tir Gofal is not a planning designation affording statutory protection to land, the areas of land in question are receiving Government financial support to achieve specific environmental objectives. The main objectives for these agreements are:
  - To maintain and enhance wildlife habitats,
  - To protect and enhance rural landscapes,
  - To protect historic features and historic landscapes, and
  - To provide enhanced public access where appropriate.

  From 16 October 2006 the running of the Tir Gofal Scheme will be passing to the Welsh Assembly Government in Newtown (their contact number is 01686 613400; this is the same as the CCW phone number until WAG provide their own direct lines). WAG will have to carefully consider the extent to which the proposed development would affect the delivery of the above objectives, and should be contacted at the address at the top of this letter regarding information on farm holdings that are subject to agreements, together with the location of key habitat areas within these holdings.
- Suggestions for viewpoints for the zone of visual influence (ZVI) have already been made to Enviros (see Annex 2). In their submission they refer to a 30km study area for this proposal, together with a 60km study area for the cumulative assessment. CCW considers that these are the study areas which should be used rather than the 25km area indicated under Section 4 of your check list.

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http://www.ccw.gov.uk

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Countryside Council for Wales

- CCW are pleased to note that the scoping report will be investigating noise (Section 8) and consider it important to assess the impact of this on people's enjoyment of the countryside, especially given the site encompasses part of the Glyndwrs Way National Trail. CCW would expect that opportunities to mitigate against these impacts would be incorporated into the final development proposals.
- I note the aspiration expressed in Tan 8 that wind farm developments will deliver environmental and social enhancements to the area in which they are situated. CCW look forward to discussing with you and the developers further ways in which this aspiration can be delivered.
- Finally, CCW note the proposal to include sections on cultural heritage and socio-economic assessment, but would prefer to see impacts on recreational users of the area to be presented as a separate section.

If you would like to discuss any aspect of this response, please contact me.

Yours sincerely

Ken Perry
Senior Conservation Officer

Encl. Annex 1: CCW Scoping advice. Plus protected species appendices.
Annex 2: Copy of CCW response to Enviros

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Annex 1: THE COUNTRYSIDE COUNCIL FOR WALES' (CCW's) SCOPING ADVICE FOR AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED LLANBRYNMAIR SOUTH WINDFARM DEVELOPMENT

1. SCOPING FOR AN ASSESSMENT OF ENVIRONMENTAL IMPACTS

The Environmental Impact Assessment (EIA) should include sufficient information to enable the planning authority to determine the extent of any environmental impacts arising from the proposed scheme on protected species and other nature conservation, countryside and landscape interests.

Evaluation of the impacts of the scheme should include: direct and indirect; secondary, cumulative, short medium and long term, permanent and temporary, positive and negative, construction phase (including impacts of construction site access) and operation phase impacts on the nature conservation resource, public access and landscape.

2. GUIDANCE

We recommend that the EIA make reference to the latest policy guidance including the following documents:

Planning Guidance (Wales) – Planning policy Wales, March 2002, Welsh Assembly Government, Cardiff.

Planning Guidance (Wales) – Technical Advice Note (Wales) 5 – Nature Conservation and Planning. Welsh Assembly Government, Cardiff..

Planning Guidance (Wales) – Technical Advice Note (Wales) 17 – Environmental Assessment. Welsh Assembly Government, Cardiff..

Planning Guidance (Wales) – Technical Advice Note (Wales) 8 – Planning for Renewable Energy, Welsh Assembly Government, Cardiff.

3. DESCRIPTION OF THE PROJECT

The entire scheme should be described in detail. This description should cover both construction and operational phases and include detailed maps and drawings as appropriate. We would expect the description to include:

- The purpose and physical characteristics of the proposals;
- Location, development size/configuration and the flexibility of the site layout;
- Land use requirements and other physical features of the project;
- Procedures for good working practices;
- Resource use, including waste, minerals and energy;
- Identification of appropriate pollution contingency measures.

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- Identification of any impacts on the landscape character of the area;

Construction Phase

- Details of construction working sites, construction access/working corridors, including noise and dust levels and stock piling sites;
- Timing of all works,
- Identification of pollution contingency and emergency measures.
- Source and type of any filling material required;
- Quantity and content of any discharges to designated sites;
- Quantity and content of any abstractions from designated sites
- Disposal of any surplus material eg material displaced from constructing bases or access roads.

Operational Phase

- Maintenance requirements of structures.
- Maintenance of any ponds, pools, wetland habitats.
- Details of access routes, alterations to traffic flows, including the type and frequency of vehicles, noise and dust levels;
- Identification of appropriate contingency plans for any emergency incidents on the site.

Decommissioning

- CCW note and accept the suggestion that this should also be included within the scope of the EIA

4. DESCRIPTION OF BIODIVERSITY

The EIA must include a description of all the existing natural resources and wildlife interests within and in the vicinity of the proposed development. CCW have already advised you to contact the Local Records Centre for this area in our 31 March 2006 response.

4.1 The Site and its Environment

The assessment should include a description of the aspects of the environment likely to be affected by the development; including the flora, fauna, soil, water, air and the inter relationship between these. Of particular relevance to this scheme are:

Key Habitats – General extended phase I survey of the site with NVC survey to sub-community level (summer) of any key habitats identified on the site, such as any areas of acid grassland which have a suppressed cover of ericoids, flushes, marshy grasslands, bogs etc. These should be mapped, or at least identified, so that any land management scheme can be aware of their potential. Wider habitats away from the turbines/track etc. should be mapped where this would provide important contextual information on the habitat resource. This would be useful in terms of assessing the effect of fragmentation where tracks and turbines would have an impact. We suggest that it will be sufficient to map these wider areas to Phase 1 level. CCW can provide Phase 1 vegetation data for this area. **Much of this has already been covered in or advice to you by letter of the 31st March 2006.**

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Site Hydrology – A detailed project scope for a hydrological study is beyond the scope of this letter but the EIA will need to assess how the proposed construction and engineering works will impact on any streams and wetland habitats present on and off the site. We suggest that, if appropriate, a detailed survey of the site hydrology is undertaken. This will indicate areas of likely habitat conservation value, give a steer on which areas should be avoided and also help to target potential enhancements. It should be the aim of the proposals to ensure no net change in run-off rates but in addition we feel the EIA should identify and address:

1. What are the potential impacts on any of the streams during construction and how they will be avoided?
2. What changes to the run-off regime might occur and how any adverse effects on the streams or surrounding habitats will be avoided (for example, through use of SUDS principles or using a matting/web material etc. for road construction)?
3. What physical changes to the site drainage (due to construction of turbine bases, infrastructure, roads etc.) are likely and how any adverse effects on the water balance, both in the streams in the wetland habitats, will be prevented?

Birds – An initial walk over of the site followed by vantage point surveys should be conducted to obtain an assessment of potential bird use of the site and assist in planning more detailed survey work. An assessment of a potential wind farm's effect on the bird interest of a site should thoroughly consider each of the three potential risks for each bird species that uses the site.

1. Displacement through indirect loss of habitat if birds avoid the wind farm area and its surrounding area due to turbine operation and maintenance/visitor disturbance
2. Death through collision or interaction with turbine blades
3. Direct or indirect habitat loss through construction of wind farm infrastructure.

More detailed survey should include:

- Migratory bird survey.
- Bird movement survey.
- Breeding bird survey (using appropriate and most up to date methodology such as the Brown and Shepherd methodology/draft SNH guidance) should be used and it may be worth including dusk visits for snipe if present.
- Non breeding bird survey (including winter usage of site).

Special attention should be paid to any raptors that may be present (particularly merlin, peregrines, red kites, goshawks etc.) and, given the proximity of forestry plantations, species such as owls and nightjars that may be using the site at dusk/night.

Bats – There is increasing evidence that a number of bat species are present at upland sites such as this. Therefore we recommend a bat survey is carried out with a minimum of three visits (ideally in June, July and August). In addition, an autumn visit to check for swarming activity and potentially a roost survey of any potential sites close to the development site should be carried out. Bat surveys should be carried out

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along transects or in areas of likely foraging value (ie, cwms, scrubland, woodland fringes). See Appendix 1 for a summary of legislation covering bats.

Other mammals – Surveys should be carried out for badgers, otter, water vole and potentially for brown hare (an LBAP species in Powys). The main issues to be assessed are the potential for disturbance during construction operations and the potential loss of otter feeding sites/water vole habitat in pools/wetlands. See Appendix 2 for a summary of legislation covering otters.

Amphibians/reptiles – It is possible that amphibians and reptiles are present on the site. Surveys should be conducted and, depending on which species are found, appropriate mitigation plans produced. The scoping document states that assessment for amphibians and reptiles will take place during the vegetation survey. This is acceptable provided that it is carried out at the correct time of year – for great crested newts in water bodies for example, survey should take place by the end of June. See Appendix 3 for a summary of legislation covering great crested newts.

We would also recommend that the developer consults with the relevant Local Authority biodiversity officer on the scope of the work to ensure that regional and local biodiversity issues are adequately considered, particularly those habitats and species listed in the Powys Local Biodiversity Action Plan. In addition, other species listed under section 74 Countryside and Rights of Way Act 2000 (see www.wales.gov.uk/subienvironment/content/guidance/list-of-species-e.pdf) are important for the conservation of biological diversity, and it is expected that these species should also be considered within the EIA.

4.2 Habitat improvements/potential mitigation measures

As outlined in our covering letter, parts of the site are covered by Tir Gofal agreements. Any proposals for habitat change (both loss due to construction and possible mitigation) need to be considered in the context of what the Tir Gofal management scheme is planned to deliver. They seek to protect and enhance biodiversity, landscape, historic and archaeological features and provide opportunities for new access to the countryside. Losses from or changes to the agreement should therefore be considered and mitigated for.

With respect to the other nature conservation interests that could be affected by the scheme, it is only possible at this stage to advise on general mitigation measures. We would welcome the opportunity to discuss this issue in greater detail as the scheme progresses. In summary, our first priority would be to prevent loss of and minimise damage to such interests within the area affected by the scheme. The EIA should include a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment, such as the micro siting of turbines, moving location of access roads, and changing timing of construction to avoid breeding periods and indicate how they will be implemented. This should clearly be set out in a management plan. However, we would wish to ensure that, where any mitigation is considered, it is of a scale and nature commensurate with the importance and extent of any interests that are adversely affected.

4.3 Monitoring and Surveillance During and Post Construction

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CCW is aware of a recent record of a red kite collision at a windfarm in Wales. Whilst the current population trend in Wales gives no reason to worry that windfarms are having an impact on red kite populations at the moment, the need for continued and further research is important and should form a part of any windfarm proposal. We therefore recommend the inclusion of details of a monitoring programme covering all protected species affected by the scheme relating to both construction and operational phases of the development.
In addition monitoring must be linked to appropriate contingency plans. It may be necessary to amend construction procedures if the monitoring programmes identify adverse impacts linked to construction or post construction activities. Scottish Natural Heritage (SNH) are in the process of developing generic guidance on this subject and CCW will aim to provide advice on interpreting this guidance in a Welsh context in the near future.

5. DESCRIPTION OF THE LANDSCAPE ASPECTS

The EIA must include a description of all the existing landscape interests within and in the vicinity of the proposed development. CCW recommend that the impacts of any development proposals on the landscape character of the area and its visual effects are assessed. This should be done using available data from CCW's LANDMAP methodology. We recommend that the impacts of any development proposals on the landscape character of the area and its visual effects are assessed against the findings of this study.

The landscape and visual impact assessment study should also address the following aspects of the project:

Site Issues

- The removal and disposal of any soil – is this to be disposed of on site or removed?
- Creation of new and re-profiling of existing access tracks
- Development infrastructure – substation, cabling, ancillary buildings, working compounds, borrow pits and sediment settling ponds should all be considered in the assessment, even if "temporary" ie only for the duration of construction works.
- Connections to the main power grid – while we appreciate the construction of new power lines is outside the scope of this proposal, in landscape terms it is inextricably linked with the wind turbines and associated development. It is therefore important that a landscape assessment of the connection route from the windfarm development to the power grid is included for consideration.

6. WIDER ISSUES

- The EIA should address key recreational users that use any public footpaths or bridleways across the application site or near the area, particularly on Glyndwrs Way National Trail (GWNT) and any other local recreational walking and cycling routes. The statement should take regard to TAN 8 with respect to distance from turbines to public rights of way (Appendix C, para 2.25-2.27)
- Details of archaeological records will be available form the Clywyd Powys Archeeological Trust (CPAT)
- Cumulative effects are likely to be significant given the potential for new developments within the SSA. The landscape assessment should consider both existing and all new proposals within the public domain in its cumulative assessment.

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APPENDIX 1 BATS: LEGISLATIVE PROTECTION

All British bats and their roosts are protected under the Wildlife and Countryside Act 1981 (as amended) and Annex IVa of the European Council Directive 92/43/EEC (c) on the Conservation of Natural Habitats and of Wild Fauna and Flora, which is often referred to as the Habitats Directive. It is implemented in Great Britain by Statutory Instrument 2716: The Conservation (Natural Habitats, &c) Regulations 1994.

The law makes it an offence to:

- kill or injure a bat
- to disturb bat(s) in a roost; or
- to damage, destroy or obstruct access to a bat roost, whether or not it is occupied at the time.

Where a European protected species such as a bat is present, a development may only proceed, under a licence issued by the National Assembly for Wales (NAW) who are the appropriate authority responsible for issuing development licences under Section 44 (1) (e) of the above Regulations. This licence can only be issued for the purposes of:

> 'preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature, and beneficial consequences of primary importance for the environment.'

Furthermore, the licence can only be issued by NAW on condition that there is:

> 'no satisfactory alternative', and that
> 'the development will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

In addition, regulation 3(4) of the Conservation (Natural Habitats, &c) Regulations 1994 requires all local planning authorities in exercise of their functions, to have regard to the provisions of the Habitats Directive in so far that they might be affected by those functions.

APPENDIX 2 OTTERS: LEGISLATIVE PROTECTION

Otters and their resting sites are protected under the Wildlife and Countryside Act 1981 (as amended) and Annex IVa of the European Council Directive 92/43/EEC (c) on the Conservation of Natural Habitats and of Wild Fauna and Flora, which is often referred to as the Habitats Directive. It is implemented in Great Britain by Statutory Instrument 2716: The Conservation (Natural Habitats, &c) Regulations 1994.

The law makes it an offence to:

- kill or injure an otter
- to disturb an otter(s) in a resting site; or
- to damage, destroy or obstruct access to an otter resting site, whether or not it is occupied at the time.

Where a European protected species such as an otter is present, a development may only proceed, under a licence issued by the National Assembly for Wales (NAW) who are the appropriate authority responsible

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for issuing development licences under Section 44 (1) (e) of the above Regulations. This licence can only be issued for the purposes of:

> 'preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature, and beneficial consequences of primary importance for the environment.'

Furthermore, the licence can only be issued by NAW on condition that there is:

> 'no satisfactory alternative', and that
> 'the development will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

In addition, regulation 3(4) of the Conservation (Natural Habitats, &c) Regulations 1994 requires all local planning authorities in exercise of their functions, to have regard to the provisions of the Habitats Directive in so far that they might be affected by those functions.

APPENDIX 3 GREAT CRESTED NEWTS; LEGISLATIVE PROTECTION

Great crested newts and their habitat are protected under the Wildlife and Countryside Act 1981 (as amended) and The Conservation (Natural Habitats, &c) Regulations 1994. The law makes it an offence to: kill or injure a great crested newt, to casue disturbance to the great crested newts in their habitat, or to damage, destroy or obstruct access to their habitat.

European Protected Species licensing

Where a European protected species, such as great crested newts, is present, a development may only proceed, under a licence issued by the Welsh Assembly Government (WAG) who are the appropriate authority responsible for issuing development licences under Section 44 (1) (e) of the above Regulations. This licence can only be issued for the purposes of:

> 'preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature, and beneficial consequences of primary importance for the environment.'

Furthermore, the licence can only be issued by WAG on condition that there is:

> 'no satisfactory alternative', and that
> 'the development will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

In addition, regulation 3(4) of the Conservation (Natural Habitats, &c) Regulations 1994 requires all local planning authorities in exercise of their functions, to have regard to the provisions of the Habitats Directive in so far that they might be affected by those functions.

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Annex 2:CCW response to ENIROS on landscape and visual impact scoping

Enviros Consulting Ltd
Shrewsbury Business Park
SHREWSBURY
SY2 6LG

Ein cyf/Our ref: (KAP/SH90/planning
Eich cyf/Your ref:RE02900/0031A/170806B

6 September 2006

For the attention of Esther Pugh

Dear Esther

LLANBRYNMAIR WIND FARM, LANDSCAPE AND VISUAL ASSESSMENT SCOPING.

Thank you for your consultation of 17 August 2006.

The Countryside Council for Wales (CCW) have the following comments to make on the locations identified on your maps for draft Zone of Theoretical Visibility (ZVT) for blade tip visibility. There appear to be only a limited spread of viewpoints, compared with other schemes I have commented on, and CCW has a number of suggestions for movement of some of those you suggest to better cover our remit for assessing the impact on peoples enjoyment of the countryside. We would also request the addition of a number of additional points. I also note that the map was only covering blade tip visibility and would assume that there will be some presentation of images showing hub height.

Locations for proposed viewpoints

CCW would wish to see consideration given to moving points 1, 3, 6 and 10 to better inform our decisions on any response to any future planning application. Some of these suggestions have been made on the basis that the route of the Glyndwrs Way National Trail on the GIS data I have access to does not appear to coincide with your references to this particular receptor. As discussed on the telephone today, this is the official route shown in the guidebook (which appears to differ a lot from the route shown on OS maps). However, before you consider my suggestions I would recommend that you contact Helen Tatchell (Glyndwrs Way Officer) in Powys County Council in Llandrindod Wells to check about the actual situation on the ground, as I understand that there are some issues to be resolved over specific localities unknown to CCW.

I have used your reference numbers in the Table below and provided new grid references and notes. However, note from those that I have checked your original grid references appear to be very wrong so I have used the points on your plan on which to base my comments.

Location	Grid reference	Notes
1	288740,304770	Move to route of Glyndwrs Way (the original location is not on the route)
3	301650, 312980	Llangadfan. This is also on the route of Glyndwrs way, and you may wish to consider whether an image taken from further north (eg at the ref I quote, by Penyfordd) may offer a

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Countryside Council for Wales

Location	Grid reference	Notes
		better opportunity to assess visual impact.
6	305840, 315190	I have asked for this new location as this is on the route of Glyndwrs Way.
10	283690,295200	The summit of Pumlumon will provide good views, but it may alternatively be worth considering the view from the road over the Glaslyn pass between Dylife and Machynlleth

Locations for Additional points

Again, I have used your reference numbers in the Table below and provided new grid references and notes.

Location	Grid reference	Notes
New point (13)	218240, 307090	View from the Y Golfa, on Glyndwrs Way looking west.
New point (14)	286200, 322400	View from summit of Aran Fawddwy looking SE, from a well used ridge walk in Snowdonia National Park.
New point (15)	306600, 313800	View from Moel Sych, Berwyn National Nature Reserve .

The windfarm application site

Although I appreciate that the actual location for individual turbines is not yet fixed, CCW would like to point out that there appear to be two or three turbines in the North-East corner of this site (as shown on your maps) outside the refined Strategic Search Area (SSA) for this locality, as identified in supplementary planning guidance for Powys (which I understand has now been agreed).

I hope that you find these comments useful but if you wish to discuss any of the above then please do not hesitate to contact me.

Yours sincerely

Ken Perry
Senior Conservation Officer

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CADEIRYDD/CHAIRMAN: JOHN LLOYD JONES OBE
PRIF WEITHREDWR/CHIEF EXECUTIVE: ROGER THOMAS

Anfonwch eich ateb at/Please reply to:
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Rhanbarth De a Dwyrain / South & East Region
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Stryd y Parc / Park Street
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Ross Allan
Enviros Consulting Ltd
61 The Shore
Leith
EDINBURGH
EH6 6RA

Ein cyf/Our ref: 1090170
Eich cyf/Your ref:RE029/0042/130508

3 June 2008

Dear Ross

LLANBRYNMAIR WIND FARM, LANDSCAPE AND VISUAL ASSESSMENT INFORMAL SCOPING.

Thank you for your consultation of 13 May 2008.

I have checked your new map against our previous comments and The Countryside Council for Wales (CCW) have the following comments to make on the viewpoint locations identified on your figure for draft Zone of Theoretical Visibility (ZVT) for blade tip visibility. Although some of your points are those that I originally requested, CCW now consider that there would be little value in using viewpoints 11,13 and 15 because they are so far away from the application site. In addition, rather than the summit of Pumlumon I would recommend that you use the Wynford Vaughan Thomas Memorial at 283585, 295955.

Locations for additional points

We would also request the addition of a number of additional points. The additional points I have given below are mostly from within the Snowdonia National Park (SNP), and are locations that CCW have agreed with the National Park Authority for assessing the potential impacts on the character of the National Park.

Location	Grid reference	Notes
New point	289330, 313270	View from Summit of Foel Dugoed, access land within SNP looking SE.
New point	281452, 310490	View from public road through forest to W of Aberangell in SNP, looking E. You may need a site visit to determine the point to give the clearest view.
New point	284240 314310	View from Foel Dinas, access land within SNP looking SE
New point	287380 293950	OS Viewpoint from minor road to Dylife at Ffrwd Fawr

Use of LANDMAP

CCW referred to the use of LANDMAP data in our original response to RES, but I want to make it clear how CCW expects to see the information used in any ES.

The EIA must include a description of all the existing landscape interests within and in the vicinity of the proposed development. This should be done using CCW's LANDMAP methodology (www.ccw.gov.uk/landmap).

LANDMAP is an all-Wales GIS based landscape resource where landscape characteristics, qualities and influences on the landscape are recorded and evaluated into a nationally consistent data set. LANDMAP comprises five spatially related datasets known as Evaluated Aspects, the five layers are the Geological Landscape, Landscape Habitats, Visual & Sensory, Historic Landscape and Cultural Landscape. All information is managed through a Geographical Information System and associated Collector database.

All five layers of LANDMAP data for Montgomeryshire are available (the last data set was quality assured in May 2007). Four layers with quality assurance are available for SNP (excludes historical). If you experience difficulty in getting this data from the LANDMAP website it should be possible for you to get the data by contacting Jenny Kamp in our headquarters. CCW would expect any Environmental Statement to demonstrate use of all five data sets in the Landscape and Visual Assessment for any wind-farm application. CCW recommend that the impacts of any development proposals on the landscape character of the area and its visual effects are assessed against the findings of this study.

Cumulative Assessment.

CCW note the operational windfarms that you are proposing to include within your assessment. We would recommend that you also include those applications that are consented (Carno Extension) or are currently within the planning system (Cemmaes 3 and Waun Garno (Acciona), Mynydd Waun Fawr (Nuon Renewables), Mynydd Clogau extension (Novera Energy) and Tirgwynt (West Coast Energy)). Any such assessment should concentrate on any impacts outside the Strategic Search Area and particularly on the Snowdonia National Park.

I hope that you find these comments useful but if you wish to discuss any of the above then please do not hesitate to contact me.

Yours sincerely

Ken Perry
Senior Conservation Officer
(by email)

ASIANTAETH YR AMGYLCHEDD CYMRU
ENVIRONMENT AGENCY WALES

Ein cyf/Our Ref : SE/2006/013562-1/1
Eich cyf/Your Ref : 01592L00088

Dyddiad/Date : 14/07/2006

Simon Peltenburg
Renewable Energy Systems UK Limited
Beaufort Court
Egg Farm Lane
Kings Langley
Hertfordshire
WD4 8LR

Renewable Energy Systems L

RECEIVED

Annwyl Syr/Madam / Dear Sir/Madam

LLANBRYNMAIR WIND FARM SCOPING OPINION REQUEST

Thank you for referring the scoping opinion request for the above proposed wind farm development, which was received on 22 June 2006. We have the following comments with regard to the scope of the Environmental Impact Assessment (EIA) and the potential effects of the proposed development:

Water Pollution

It is anticipated that the construction phase would have the biggest potential to cause water pollution. We would expect the Environmental Statement to address the significant pollution risk posed by the construction phase and to provide details on the mitigation measures that are proposed to prevent pollution of watercourses. In particular, the EIA must fully assess the potential effects of the proposed access route(s) to the site and the mitigation measures that will be put in place to prevent pollution of watercourses with silt or other contaminants during the construction phase.

The Nant Craigyfran, the Nant Friddycastell, the Afon Cannon, the Nant y Graig Lwyd and the majority of the other watercourses in the vicinity of the proposed site are tributaries of the Afon Gam. The Afon Gam has a General Quality Assessment (GQA) grade A for water chemistry and a GQA grade B for biology, and it is a designated Salmonid fishery. It is therefore vital that all watercourses in the area are protected from pollution.

The Guidance document Pollution Prevention Guideline 6; "Working at construction and demolition sites", which is available on our website, gives best practice information for the storage of fuels and waste disposal during construction works. The developer should make themselves familiar with the guidance prior to the commencement of any activities.

The area proposed for development receives approximately 1,750 mm of rainfall per annum and includes steep slopes. These factors increase the risk of surface water contaminated with

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silt running off site roads, drainage channels etc and discharging to watercourses. Silt pollution causes lasting damage to river life such as fish, insects and plants and can also build up to cause flooding. Consequently, the developer should follow the guidance contained within the leaflet 'Silt Pollution and How to Avoid It', which is also available on our website.

We would require full consultation should this development proceed. Prior to works commencing a Method Statement should be agreed with us. This should include all measures taken to prevent detriment to the environment and any contingency plans, with reference in particular to the minimisation of risk of pollution of watercourses with silt, and the storage of fuels and any other hazardous materials stored on site.

Access roads on site should be constructed in such a way, and of such material, that suspended solids are not allowed to wash off site and discharge to watercourses during periods of heavy rain. Where there is a risk of such a discharge, adequate interception facilities should be put in place to ensure that there is no adverse affect on water quality. The developer should consider the construction of temporary silt traps and provision should be made for their maintenance. Roadside drains likely to carry high sediment loads must not be allowed to discharge directly to streams. No rainwater contaminated with silt/soil from disturbed ground during construction must drain to watercourses without sufficient settlement.

Where there is a likelihood of site drainage containing suspended solids and/or silt the effluent should be contained within a settlement lagoon or similar facility, such that any discharge from site be free of suspended solids. These facilities should be capable of containing the effluent from a 1 in 100 year rainfall event.

Fuel and oil storage and refuelling operations on site should be contained within a bunded area to ensure that no spillage can escape into the aquatic environment.

Any washing out facilities for concrete mixers on site should be constructed in such a way that all effluent produced is contained and this effluent should be disposed of in accordance with all current waste management legislation.

No development should be commenced until a scheme for the disposal of foul drainage from any toilet/washroom facilities has been approved by us.

Biodiversity

The EIA will need to assess the effects of the proposal on any uncultivated land, as required under the relevant Environmental legislation. The development should seek to have no adverse impact on natural habitats, ecology and the wildlife of the area. In certain locations, such as in more recent coniferous forestry plantations and improved grassland, there is the potential to restore the former open natural habitat/landscape degraded or lost to non-native forestry plantations and agricultural improvement. Restoration of upland moor and blanket bog, and removal of artificial forestry and agricultural drainage will help reduce peak run-off, attenuate flows and improve the water quality and the habitat of the watercourses which they feed.

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The developer should consider managing the area under a suitable agri-environmental scheme such as Tir Gofal to ensure environmentally sensitive farming practices. The associated infrastructure should not be used as a mechanism to improve the agricultural productivity of the area, either through "improved" drainage or through provision of winter-feed using new track infrastructure.

The impact of the physical structures (e.g. turbines, foundations, crancage points, etc) and supporting infrastructure (e.g. tracks, hard-standing, cabling, etc) will need to be minimised and mitigated for. Siting of turbines will need to be considered carefully to avoid important habitats and plant communities and to ensure bird species and population are not adversely affected. The Countryside Council for Wales (CCW) can advise further on this matter (Note: turbine noise and movement may affect the behaviour and breeding success of birds and other animal species which rely on visual motion detection to avoid predators).

Watercourse crossings and impacts on the natural hydrology will need to be minimised and avoided wherever possible to ensure no adverse impact on protected species, important habitats and their hydrological links.

With regard to potential mitigation and enhancement opportunities, the creation of suitable habitats on degraded or damaged habitats may be appropriate. Opportunities should be taken to create marsh, wetland and open water communities. However, it must be stressed that any such enhancement should not be at the expense of other existing water dependent habitats.

Professional consultants should be appointed to carry out the necessary environmental assessments and to advise on all conservation related aspects of the proposals. CCW and Montgomeryshire Wildlife Trust (MWT) should be consulted as they may hold information on species and habitats within the proposed area and information on nearby designated sites. These include: Corsydd Llanbrynmair Site of Special Scientific Interest (SSSI) (900m distant), Gweubydd Dolwen SSSI (150m distant), and Hafod y Beudy, Llangadfan Site of Importance for Nature Conservation (SINC) (400m distant) and Clegymant, Llanbrynmair SINC (1100m distant).

Groundwater

The proposed site covers a large area and is therefore underlain by a number of geological formations, the Penstrowed Grits Formation, is comprised of sandstone, the Nant-Ysgollen Shales Formation, comprised of Argillaceous rocks; the Llandovery Argillaceous Rocks and the Cwymystwyth Grits Group, comprised of sandstone.

This Penstrowed Grits Formation and Cwymystwyth Grits Group are classed as minor aquifers of low to intermediate vulnerability to pollution, as defined by our 'Policy and Practice for the Protection of Groundwater'. However there are numerous private abstractions in the area.

There are approximately six private groundwater abstraction located on the outlined site, with a number of further groundwater abstractions located close to the borders of the site.

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There are no contaminated land sites known to us located within 2km of the proposed location of the wind farm.

The scoping opinion does not appear to address the geology and hydrogeology of the site. The impact the development may have on the groundwater and groundwater users must be fully assessed in the Environmental Statement. Any potential land contamination must also be considered, looking at any issues which may be created by the development e.g. oils, piling, and temporary works.

Flood Risk

The Environmental Statement must consider the potential effects of surface water runoff as the development and its associated infrastructure has the potential to generate a significant volume of surface water run-off. Therefore, an assessment of the proposed impermeable area should clearly indicate how the surface water will be controlled and attenuated so as not to adversely affect downstream properties and land. The developer should refer to Section 8 of TAN15 (July 2004).

It is recommended that the developer consults with the Local Authority's Engineers Department in order to establish that should any surface water drainage from this site be discharged to a watercourse, ditch or culvert (excluding statutory main rivers) that such discharge will not cause or exacerbate any flooding in this catchment.

The surface water drainage system of any new development should be designed in accordance with SUDS principles. The rate of surface water discharge from the site should be no greater than from it's greenfield state.

The proposed site access roads may require the culverting of watercourses. Any culverting of a watercourse requires the prior written approval of the Local Authority under the terms of the Public Health Act 1936, and our prior written consent under the terms of the Land Drainage Act 1991/Water Resources Act 1991. We seek to avoid culverting, and its consent for such works will not normally be granted except for access crossings. The EIA should consider the effects of these structures.

The developer should be aware of his responsibilities to ensure that the operations do not interfere with riparian owners common law rights to receive water undiminished in quantity or quality. If any watercourses crossing the site are interrupted or diverted, then notwithstanding the need for any statutory consents or licences, it is the developer's responsibility to take appropriate steps to protect the rights of the riparian owners, for which they have a liability.

Other Comments

The EIA must consider the potential for cumulative effects of this development with other wind farms or major developments in the area.

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The Environmental Statement should consider the impacts of waste generated during the construction of the development. Any waste excavation material or building waste generated in the course of the development must be disposed of satisfactorily and in accordance with Section 34 of the Environmental Protection Act 1990. If during construction works any contaminated material is revealed then the movement of such material either on or off site should be in consultation with us.

Carriers transporting waste from the site must be registered waste carriers.

If controlled wastes are to be utilised for construction purposes the developer must register the activity with us. The Duty of Care Regulations apply to all movements of controlled waste.

We would welcome the opportunity to discuss these issues further prior to the submission of a planning application. A site meeting between the applicant (or their representative) and Countryside Council for Wales (CCW), Montgomeryshire Wildlife Trust (MWT) and the Environment Agency would be an appropriate way to identify and progress the issues raised in this letter.

Should you wish to discuss any of the above matters further, please do not hesitate to contact us.

Yn gywir/Yours faithfully

DAVID REVILL
Swyddog Cydlynu Cynllunio/Planning Liaison Officer

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Beaufort Court
Egg Farm Lane
Kings Langley
Hertfordshire
WD4 8LR

Renewable Energy Systems Ltd

29 MAR 2006

RECEIVED

20th March 2006

Dear Mr Peltenburg

Thank you for consulting us on the proposed wind farm project between Llanbrynmair and Llanerfyl, Montgomeryshire.

The Trust has a set approach to Windfarm proposals. This can be stated in the following terms:

In common with the other Wildlife Trusts in Wales, and other conservation organisations including the RSPB, the Montgomeryshire Wildlife Trust closely examines any windfarm proposals placed before respective local authorities.

The Trust determines the likely impacts of the proposal on wildlife and uses this information to decide whether to object to the proposal. Our charitable objectives preclude us from objecting to any developments on aesthetic or landscape grounds, instead we closely examine any ecological impacts and then comment accordingly.

In other words we judge each application on its own merits.

The areas of wildlife interest around Llanbrynmair moors that are known to Montgomeryshire Wildlife Trust are listed on the table below. We are also aware through personal communication that there are both black grouse and red grouse present on the Llanbrynmair moors.

MONTGOMERYSHIRE wildlife TRUST
YMDDIRIEDOLAETH NATUR MALDWYN

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THE wildlife TRUSTS

wildlife WATCH

Amddiffyn **Bywyd Gwyllt** i'r dyfodol Protecting **Wildlife** for the future

KNOWN SITES IN LLANBRYNMAIR AREA			
DESIGNATION & NAME	GRID REFERENCE	HABITAT	AREA (ha)
SITE OF SPECIAL SCIENTIFIC INTEREST			
Berwyn	Very large area	Moorlands	27132.5
ANCIENT WOODLAND *2			
	290390, 305530	Ancient semi-natural	2.6
	290950, 305990	Ancient replanted	34.6
	291780, 306420	Ancient semi-natural	7.1

We suggest that all data and information on these sites and species records for the Llanbrynmair area be obtained from the Biological Information Service for Powys and The Brecon Beacons National Park (BIS):

Janet Imlach
Manager
Biodiversity Information Service
First Floor Offices
4B Lion Yard
Brecon
Powys
LD3 7BA

Tel 01874 610881
Fax 01874 624812

In summary, the trust will oppose any development that may detrimentally impact on wildlife in the area. Projects that aim to improve the land for wildlife and increase biodiversity will be looked upon favourably.

The Trust has had previous experience of restoration of bog habitats through tree felling and ditch blocking both on and off our reserves and we would be happy to discuss giving advice and information on these issues.

I hope you find the above comments useful.

Yours Sincerely

Emma Kinnings
Assistant Conservation Officer

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Cadw

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Mr Simon Peltenburg
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Renewable Energy Systems UK Limited

17 JUL 2006

RECEIVED

Eich cyfeirnod Your reference	
Ein cyfeirnod Our reference	A-CAM011-09-0090-00
Dyddiad Date	13 July 2006
Llinell uniongyrchol Direct line	01443 33 6097
Ebost Email:	Heather.Bassett-Jones@wales.gsi.gov.uk

Dear Mr Peltenburg

LLANBRYNMAIR WIND FARM SCOPING OPINION REQUEST

Thank you for your letter of 21 June 2006, regarding the proposed wind farm at Llanbrynmair, Powys.

We have carried out a new search on the proposed area identified and confirm that our previous comments dated 05 May 2005 still apply (copy attached). There will be a direct effect upon the scheduled monument known as Ffridd Cwm y Ffynnon round barrow (MG314). The scheduled area of this monument is shown outlined in red on the attached plan. Five other scheduled ancient monuments are in the vicinity of the proposal, but are not affected.

It is noted that the scoping Checklist appears to address the cultural heritage and it is the view of Cadw that the following should be assessed by your consultant:

a. all sites and features of the historic environment within the windfarm and infrastructure whether scheduled or not;
b. listed buildings;
c. Historic Parks and Gardens, Historic Landscapes, to include an appropriate assessment of the character and impact upon these landscapes.

The impact should be assessed on these features of historic interest both directly and on their setting. Any direct disturbance to a Scheduled Ancient Monument will, of course, require scheduled monument consent in advance from Cadw.

Cadw request to be consulted further at a later stage once the Environmental Statement has assessed the impact.

The above information provided only relates to scheduled ancient monuments and Cadw suggests information on unscheduled sites should be obtained from the Historic Environment Record (formerly known as the Sites and Monuments Record) held by Clwyd-Powys Archaeological Trust, 7a Church Street, Welshpool SY21 7DL, if you have not already done so.

Yours sincerely,

Heather Bassett-Jones

Heather Bassett-Jones
Gweinyddu Henebion / Ancient Monuments Administration

APPENDIX 2.1: WIND POWER AND THE ELECTRICITY NETWORK

1.1 The Electricity Network

Transmission and Distribution

1.1.1 The electricity network, or grid, can be split into two major components: the transmission network and the distribution network. The transmission network consists of high voltage (greater than 132kV in England and Wales and usually greater than 66kV in Scotland) power lines designed to transfer bulk power from conventional major generators to regions of demand, whilst the distribution networks distribute power at a lower voltage from the transmission networks to consumers.

1.1.2 The transmission network is operated by the National Grid Company (NGC) and the transmission network by a number of Distribution Network Operators (DNOs) such as Western Power Distribution and Scottish and Southern Energy.

1.1.3 The traditional system of a few large centralised generators supplying the nation's power via the transmission network to the distribution network is beginning to change. There are an increasing number of smaller generators being connected directly on to the distribution network, closer to local demand. This is sometimes referred to as embedded generation or distributed generation.

Demand

1.1.4 The demand for electricity constantly fluctuates and network system operators must predict demand on a continuous basis using historical demand, weather forecasts, the calendar, and social activity data. For example, spikes in demand can occur during the intervals of popular television programmes when a large number of people turn the kettle and lights on at the same time; this was clearly highlighted at the end of the 1998 England-Argentina football match when demand increased by 2,800MW.

1.1.5 Generally however, the larger the electricity system, the smaller (in relative terms) the variations in consumer demand are, due to geographical diversity. This means that with a large system such as the UK's, the demand pattern over time fluctuates fairly smoothly and allows the forecasting, on the 4 to 12 hour timescale, to be as accurate as within 1.4%.

Generation

1.1.6 Fossil fuel, nuclear and renewable electricity generators connected to the network are used in a number of ways. The first is to supply baseload power, whereby the generator operates continually at a constant output to supply the base (minimum) demand that is constantly required. Nuclear power is well suited for this as it cannot readily alter its output. The second copes with the daily variability in demand and will sometimes be shut down at night; these are termed 'mid-merit' generators. The third are 'peaking' plant or generators that cope with short-term peaks in demand, typically in the mornings and evenings. Hydro and gas plant are often used for this purpose due to their quick response and start times.

Operating Reserve

1.1.7 To ensure reliability of the grid in the event that one of the generators goes off-line or an interconnector from France fails for any reason, there will also be 'operating reserve' generators on stand-by. The operating reserve generators can be 'spinning', 'standing' or 'instantaneous'.

1.1.8 Spinning reserve means that the generator is part loaded and kept spinning. It will be synchronised to the network and prepared to produce output within five minutes if required. A standing reserve generator does not need to spin as it can pick up output from a standstill within five minutes, for example, pumped storage and certain types of gas turbine plants. Instantaneous generators are those which are able to increase output for a few minutes until the spinning or standing reserve becomes effective. Spinning reserve from thermal fossil fuel generators is quite common and although the generators have a low efficiency spinning at part load, they consume significantly less fuel than at full load.

1.2 Wind Power on the Network

Balancing Generation and Demand

1.2.1 Wind is an intermittent source of power, that is, its output will fluctuate. However, just like fluctuations in consumer demand, wind power is also fairly predictable on shorter time scales. This is because wind monitoring data and prediction modelling are used, and because the greater the number and spread of wind turbines, the more even the power output due to the geographical variations in wind speed.

1.2.2 When considered in conjunction with electricity demand fluctuations, wind power only leads to a very small increase in uncertainty for the system operators, provided wind capacity is less than about 20% of total demand (managing this uncertainty is easily achievable and discussed below). For this reason, and the fact that wind power is usually connected to the distribution grid at the demand end of the network, wind power output is often regarded as a negative load, directly lessening demand.

The Need for Operating Reserve

1.2.3 As wind capacity increases, measures will be needed to cope during periods when wind speeds are below

1.2.4 4m/s and above 25m/s over large areas of the country. This can be done in a number or combination of ways:

- increase the reserve capacity;
- curtail some of the wind generation going on to the grid (it could be used in conjunction with pumped storage systems or, in the future, to produce hydrogen);
- increase the inter-connector capacity and area.

1.2.5 A worst case scenario study on reserve capacity, cited by the Carbon Trust and DTI (2004), reveals that for an installed wind capacity of 3,000MW, an extra 200MW of spinning reserve will be required. This is just under 7% of the rated wind capacity and dispels the common misconception that for every new MW of wind power installed, a further MW of new conventional plant is required to back it up during calm spells. The small amount of extra spinning reserve required should not, in fact, require any new conventional plant capacity because wind generation is expected to increase more rapidly than electricity demand, therefore existing fossil fuel generators will use less fuel and consequently have reserve capacity available. Table 2.1 clearly shows that the requirements for extra reserve generation are only a very small proportion of expected displaced thermal plant capacity.

Table 2.1: Wind Penetration and the Grid

Source: The Carbon Trust and DTI (2004)

	UK Power System	
Penetration of intermittent renewable power sources	10%	20%
Dispatched wind generation in MW	About 12,000MW	About 24,000 -26,000MW
Requirements for extra operating generation reserve	Between 400 – 700 MW	In range between 3% to 7.6% of intermittent dispatched generation
Capacity Credits (displaced thermal plant)	3,300MW	c. 5,000MW or about 20 - 25% of intermittent generation

1.2.6 However, there is a limit to the amount of wind power that can be connected to the present UK electricity network. After around 20% wind penetration the costs of maintaining a reliable electricity supply will start to rise and an increasing amount of reserve will be required. It is possible to increase penetration levels beyond 20% (as some areas of Denmark have done), however, reliability will depend onthe size of the entire interconnected network and the mix of other generators on the network.

For example, gas and hydro plants combine with wind better than nuclear as they are more easily able to alter their output.

1.2.7 In the future, operating reserve may be supplied from other renewable sources, such as biomass, marine and small hydro power, and from energy storage systems such as fly wheels and hydrogen.

Capacity Credit

1.2.8 Capacity credit is the amount of thermal plant that is actually displaced by wind power. According to Table 2.1, the displaced thermal capacity will be approximately 25% to 27% of the wind generator capacity. This is mainly due to the intermittent nature of wind as wind capacity is measured as the rated, or peak, power output during good wind speeds, which are only achieved on average between 25 to 33% of the time in the UK. Thus a 10MW power rated wind farm has the potential to generate an average of approximately 58,000MWh of energy per year, and a 10MW fossil fuel generator has the potential to generate around 175,000MWh per year (but will only do so if operated at constant full load).

1.2.9 However, for every MWh of energy produced by wind generators, nearly one MWh generated from conventional plant will be displaced. It does not quite displace a full MWh because of the small amount of additional operating reserve required, which is often supplied by spinning fossil fuel generators. The energy consumed for spinning reserve is, however, allayed to some extent by a reduction in transmission energy losses due to the fact that wind generators are usually connected directly on the local distribution networks close to the customers.

1.2.10 Furthermore, a typical coal fired power plant is around 30% efficient, and combined cycle gas plant approximately 50% efficient, and so the fuel energy input into the plant is significantly greater than the electricity energy output. Thus, for every MWh of energy generated by wind, close to 3MWh of 'raw' coal energy can be saved, or nearly 2MWh of gas energy. This then becomes very significant with respect to greenhouse gas emissions.

Power Quality

1.2.11 Apart from balancing generation and demand and ensuring there is sufficient reserve, the network operators must also ensure power quality is maintained. Wind power does introduce additional power quality issues for the distribution network operators because the direction and quantity of real and reactive power flows will change. However, this is not an insurmountable technical issue and the addition of embedded generation (that is, generators connected to the distribution network rather than transmission network) can actually reinforce the distribution networks.

1.2.12 Reference: The Carbon Trust and DTI (2004) *Renewables Network Impacts Study, Annex 4: Intermittency Literature Survey and Roadmap*.

APPENDIX 2.2: CARBON BALANCE ASSESSMENT

1.1 Introduction

1.1.1 Windfarms are seen as an important mechanism for reducing the UK's carbon dioxide emissions from electricity generation; however peatlands are a key long-term carbon store. The total carbon savings from a windfarm are estimated with respect to emissions from different electricity generating sources and improvement of habitat, while losses of carbon are due to production, transportation, erection, operation and dismantling of the windfarm, backup power generation, loss of carbon-fixing potential of peatland, loss of carbon stored in peatland and loss of carbon-fixing potential as a result of forestry clearance. In order to calculate the true payback time of a windfarm in terms of carbon, all these emissions and savings need to be estimated.

1.1.2 Organic soils are abundant in Scotland and Wales and they contain the majority of soil carbon stocks in the UK. Organic soils include deep peats, which are composed almost entirely of a deep layer of organic material, and organo-mineral soils, which have a thinner layer of organic material overlaying mineral soil layers or rock. New calculations undertaken as part of the project titled 'Estimating Carbon in Organic Soils - Sequestration and Emissions' (ECOSSE, 2007) show that organic soils in Wales contain around 196Mt of carbon. These estimates omit the carbon content in the mineral soils and are greater than all the carbon held in surface vegetation in the UK which is estimated to be 114Mt carbon (Milne & Brown, 1995).

1.1.3 Natural Resources Wales (NRW) advocate using the Scottish Government's Windfarm Carbon Assessment Tool in their guidance note: Assessing the Impact of Windfarm Developments on Peatlands in Wales (CCW; 2010 – presently NRW). Colloquially referred to as the 'Carbon Calculator', the Excel tool is used to estimate the impacts of windfarm developments on the carbon dynamics of peatlands by determining the potential carbon losses and savings while taking into account peat removal, drainage, site restoration and habitat improvement. Although this methodology was designed to be used for Scottish windfarm developments, in the absence of specific Welsh guidance, it has been used here to assess the carbon payback period of the proposed Llanbrynmair windfarm development.

1.1.4 The carbon calculator version that has been used to estimate the payback period of the proposed Llanbrynmair windfarm was issued in October 2012 and is described in the methodology section below. The calculator and associated research report was developed by the University of Aberdeen and the Macaulay Land Use Research Institute, and funded by the Rural and Environment Research and Analysis Directorate of the Scottish Government.

1.2 Structure of Report

1.2.1 This report contains a summary of the methodology for each of the areas covered by the Scottish Government Windfarm Carbon Calculator Tool - Version 2.7.0. The full methodology is detailed in more depth in Calculating Carbon Savings from Wind Farms on Scottish Peat Lands – A New Approach (Nayak *et al.*, 2008). Where site or country specific values are required, the data sources are detailed in the methodology. The results section details the estimated savings and losses due to the proposed windfarm and the carbon payback period of the proposed development.

1.3 Methodology

1.3.1 The Scottish Government Windfarm Carbon Calculator Tool - Version 2.7.0 and methodology report 'Calculating Carbon Savings from Wind Farms on Scottish Peat Lands – a new approach' (Nayak *et al.*, 2008) was used to estimate the carbon payback period of the Llanbrynmair Windfarm. The spreadsheet tool contains 18 worksheets, all connected to the Core Input Data sheet. The details of the worksheets are given in Table 1.

Table 1 Detail of Worksheets in the Carbon Calculator Tool

Worksheet	Explanation
Instructions	This provides description of all worksheets contained in the spreadsheet calculator tool with full explanation of the calculation and assumptions made.
Core Input Data	All the data are entered through this single worksheet. The input parameters contain some variables that can be specified by default values but others that must be site specific.
Forestry Input Data	Option to calculate capacity factor from forestry data, or to include detailed forestry management.
Construction Input Data	Option to input detailed construction data.
Payback Time	The carbon payback time of the windfarm is calculated by comparing the loss of carbon from the site due to windfarm development with the carbon-savings achieved by the windfarm while displacing electricity generated from coal-fired capacity or grid-mix.
1. Windfarm CO_2 emission saving	This is estimated with respect to emissions from different fuel mixes for generating electricity supplied to the National Grid. The emission factors are for three different fuel mixes that it is assumed that electricity generated by the windfarm would displace.
2. CO_2 loss due to turbine life cycle	The life cycle of the windfarm is calculated from the emissions caused by the manufacture, construction and decommissioning of the turbines. This is calculated as a default value from a literature review of 18 European sites or can be entered as a site specific value if this is available from the manufacturer.
3. CO_2 loss due to backup	As wind generated electricity is inherently variable, accompanying backup power is required to stabilise the supply. The extra capacity needed for backup power generation is currently estimated to be 5% of the rated capacity of the windfarm if wind power contributes more than 20% to the national grid. If the contribution of wind energy to the grid is less than 20%, the extra capacity needed for backup is assumed to be zero.
4. Loss of CO_2 fixing potential	Peat is removed during the construction of the windfarm infrastructure and, as a result, there is a loss of carbon fixing potential of the associated vegetation. During the construction phase, the soil may be drained by design, or unintentionally, which has significant effects on the vegetation of peat lands. The loss of the carbon fixing potential of the peatland is calculated for the area from which peat is removed and also from the area affected by the drainage. For Llanbrynmair windfarm, this is calculated assuming 100% of bog plants from removed and drained peats.
5. Loss of soil CO_2	The loss of carbon stored in peatland is estimated from the percentage lost by peat removal. This is calculated as the sum of losses from removed and drained peats in CO_2 equivalents.
5a. Volume of peat removed	The percentage of the site where peat is removed is estimated from the area covered by borrow bits, turbine foundations, hard-standing and access tracks. This is calculated from the area and depth of peat associated with constructed features at a given site and assumes that peat is evenly distributed across the site and that no attempt is made to avoid peat areas.
5b. CO_2 loss from removed peat	This is initially calculated assuming the peat is not restored. The reduced losses from restored peat are later added back in the worksheet describing restoration if it can be shown that this is planned.
5c. Volume of peat drained	This is calculated using the extent of the area affected by drainage around each feature that is drained or affects the hydrology.
5d. CO_2 loss from drained peat	The extent of drainage around the site of construction strongly influences the volume of peat impacted by the development of the windfarm. This is calculated differently depending on whether the site is restored, and if the level of the water table returned to its original depth on decommissioning. The extent of drainage around the site of construction strongly influences the total volume of peat impacted by the construction of the windfarm. Where sufficient measurements are available to describe the hydrological features of the windfarm area, this should be used together with a detailed hydrological model to simulate the likely changes in peat hydrology. If

Worksheet	Explanation
	insufficient measurements are available, a worst case estimate of extent of drainage around the development features should be used.
5e. Emission rates from soils	Depending on the option selected in the input data sheet, the emission rates from soils are calculated either by the Intergovernmental Panel on Climate Change (IPCC) methodology, or using site specific equations. For the Llanbrynmair windfarm, the site specific methodology was used.
6 CO_2 loss by DOC and POC loss	Carbon losses from dissolved organic carbon (DOC) are calculated using a simple approach derived from estimates of total carbon loss leached as DOC and the percentage of leached DOC lost as carbon. Dissolved and particulate organic carbon (POC) losses are estimated with respect to the carbon dioxide emissions. It is assumed that in the long-term 100% of leached DOC is lost as carbon.
7. CO_2 loss – felling forestry	Emissions due to forest felling are calculated from the reduced carbon sequestered per crop rotation. This is only included if the forestry was scheduled to be replanted following felling. If a forestry plantation was due to be felled with no plan to replant, the effect of the land use change is not attributable to the windfarm development and should be omitted from the calculation.
8. CO_2 gain – site improvement	Gains in soil carbon stocks due to habitat improvement of degraded bogs and land under felled forestry, restoration of peat in borrow pits, and early blocking of drains around hard-standing and foundations are calculated using the methodology selected in the input data worksheet.

1.3.2 The data entered into the input sheet for the Llanbrynmair windfarm was sourced mainly from the spreadsheet of the key information about the site and the planned infrastructure supplied by RES, the preliminary peat probe results and from consultation with the project ecologist and hydrologists. Where site specific parameters were unavailable, default values suggested by the methodology were used. Sensitivity analysis was incorporated into the assessment to demonstrate the impact on the overall payback of changing specific parameters where the Carbon Calculator makes assumptions or values are based on best available evidence. The key assumptions made are listed in Table 2.

Table 2 - Data Sources and Key Assumptions for Input Data

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Windfarm Characteristics					
Number of turbines	30	30	30	Key information from RES	
Lifetime of windfarm (years)	25	25	25	Duration of planning permission	
Turbine capacity (MWh)	2.3	2.0	3.0	Key information from RES	Potential turbine options.
Capacity factor (percentage efficiency)	25.4	22.9	27.9	Default value	Wales average 25.4% (DECC, 2011). 10% range applied.
Extra capacity required for backup (%)	1.05	0.945	1.155	Default value	Wind energy contribution in UK 2011was 4.2% (DECC, 2012). Therefore, 4.2/20*5% = 1.05%. 10% range applied.
Additional emissions from reduced thermal efficiency of reserve	10	10	10	Default value	
CO_2 emissions from turbine life cycle (tonnes CO_2 $turbine^{-1}$)	Calculate with respect to installed capacity	Calculate with respect to installed capacity	Calculate with respect to installed capacity	Default value	
Characteristics of Peatland Before Windfarm Development					
Type of peatland	Acid bog	Acid bog	Acid bog	Default value	Although site is composed of fen and acid bog, only acid bog is available in version 2.7.0.
Average annual air temperature at site (°C)	8.6	8.6	8.6	Key information from RES	Measured from met mast.

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
C Content of dry peat (% by weight)	55	49.5	60.5	Default value	As advised in Scottish Government (2008). Average carbon content of dry peat from literature; e.g. Birnie *et al*. (1991) – range 49% to 62%. 10% Range applied.
Average extent of drainage around drainage features at site (m)	4.10	2.05	6.15	Calculated by project hydrologist.	Value determined from on-site assessment – details presented within Chapter 8: Hydrology and Hydrogeology. 50% Range applied.
Average water table depth at site (m)	0.12	0.06	0.18	Calculated by project hydrologist.	Value determined from on-site assessment – details presented within Chapter 8: Hydrology and Hydrogeology. 50% Range applied.
Dry soil bulk density ($g\ cm^{-3}$)	0.10	0.09	0.11	Literature; e.g. ECOSSE; 2007.	10% Range applied.
Characteristics of Bog Plants					
Time required for regeneration of bog plants after restoration (years)	10	10	10	Conservative value	Carbon Calculator Protocol suggests 90% recovery within 6 years (as per cell B97).
Carbon accumulation due to C fixation by bog plants in undrained peats ($tC\ ha^{-1}\ yr^{-1}$).	0.25	0.25	0.25	Default value	From literature – range of apparent C accumulation rate in peatland is 0.12 to 0.31 $tC\ ha^{-1}\ yr^{-1}$
Forestry Plantation Characteristics					
Method Used to Calculate CO_2 Loss from Forest Felling	Simple Data	Simple Data	Simple Data	Default value	Simple methodology sufficient with available data.

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Area of forestry plantation to be felled (ha)	149	134	164	Appendix 5.3: Outline Habitat Management Plan	10% Range applied.
Average rate of carbon sequestration in timber (tC ha^{-1} yr^{-1})	1.65	-0.3	3.60	Default and literature values	Brainard *et al*. (2009) report forestry on peat being a net emitter of CO_2 at a rate of 0.3 tC/ha/year; this has been used as the minimum value. The Carbon Calculator identifies a sequestration rate of 3.60 tC/ha/year; this value has been used as the Maximum value. This assumes a yield class of 16m^3 ha^{-1} y^{-1} and suitable ground conditions. This is likely to be an overestimate; the yield class is not known and the forestry is in poor condition following plantation on deep peat. The expected value is the mean of the two.
Counterfactual Emissions Factors					
Coal-fired plant emission factor (t CO2 MWh^{-1})	0.86	0.774	0.946	Default value	From DEFRA, 2002. Guidelines for the measurement and reporting of emissions by Direct Participants in UK Emissions Trading Scheme. 10% Range applied.
Grid-mix emission factor (t CO2 MWh^{-1})	0.43	0.387	0.473	Default value	
Fossil fuel mix emission factor (t CO_2 MWh^{-1})	0.607	0.5463	0.6677	Default value	5 year average emission factor calculated using estimated CO_2 emissions
Borrow Pits					
Number of borrow pits	6	6	6	Key information from RES	Further detail presented in Chapters 3 (Project Description), Chapter 5 (Ecology) and Chapter 8 (Hydrology and Hydrogeology). 10% Range applied where applicable.
Average length of pits (m)	60	54	66	Key information from RES	
Average width of pits (m)	60	54	66	Key information from RES	

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Average depth of peat removed from pit (m)	0.15	0.135	0.165	Identified from peat probe depths undertaken at borrow pit locations.	
Foundations and Hardstanding Area Associated with each Turbine					
Method Used to Calculate CO_2 Loss from Foundations and Hardstanding	Rectangular with vertical walls	Rectangular with vertical walls	Rectangular with vertical walls	Default value	Proposed foundations would be tapered octagonal gravity bases. 'Rectangular' is the only option available in the simple and detailed input fields.
Average length of turbine foundations (m)	17	15.3	18.7	Key information from RES	Further detail presented in Chapters 3 (Project Description), Chapter 5 (Ecology) and Chapter 8 (Hydrology and Hydrogeology). 10% Range applied where applicable.
Average width of turbine foundations(m)	17	15.3	18.7	Key information from RES	
Average depth of peat removed from turbine foundations(m)	0.5	0.45	0.55	Identified from peat probe depths undertaken at turbine locations.	
Average length of hardstanding (m)	66	59	73	Key information from RES	
Average width of hardstanding (m)	66	59	73	Key information from RES	
Average depth of peat removed from hardstanding (m)	0.5	0.45	0.55	Identified from peat probe depths undertaken at turbine locations.	

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Access Tracks					
Total length of access track (m)	23,215	21,190	25,240	Key information from RES	Minimum value equates to total length of new track. Maximum value equates to total length of new track plus all existing track. The Expected value is a mean of the two. Details on the existing and new track are provided in Chapters 5 and 8; peat is not associated with the existing track but is included to provide an upper range.
Existing Track Length (m)	2,025	4,050	0	Key information from RES	Minimum value equates to total length of existing track. Maximum value assumes no existing track. The Expected value is a mean of the two.
Length of Access Track that is Floating Road (m)	0	0	0	Key information from RES	No floating roads are proposed.
Floating Road Width (m)	N/A	N/A	N/A		
Floating Road Depth (m)	N/A	N/A	N/A		
Length of Floating Road that is Drained (m)	N/A	N/A	N/A		
Average Depth of Drains Associated with Floating Roads (m)	N/A	N/A	N/A		
Length of access track that is excavated road (m)	23,215	21,190	25,240	Calculated by project hydrologist.	Minimum value assumes excavation of total length of new track. Maximum value assumes excavation of total length of new track plus all existing track. The Expected value is a mean of the two.

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Excavated road width (m)	7.5	6.75	8.25	Key information from RES	5.0m running width with 0.25m shoulders either side, plus 1.0m either side allocated for drainage. 10% Range applied.
Average Depth of Peat Excavated for Road (m)	0.26	0.13	0.39	Appendix 8.1: Peat Extraction Volumes	50% Range applied
Length of access track that is rock filled road (m)	0	0	0		No rock filled roads are proposed.
Rock filled road width (m)	N/A	N/A	N/A		
Rock filled road depth (m)	N/A	N/A	N/A		
Length of rock filled road that is drained (m)	N/A	N/A	N/A		
Average Depth of Drains Associated with Rock filled Roads (m)	N/A	N/A	N/A		
Cable Trenches					
Length of any Cable Trench on Peat that Does Not Follow Access Tracks and is Lined With a Permeable Medium (e.g. sand) (m)	0	0	0	Key information from RES	All cable trenches to follow access tracks.
Average Depth of Peat Cut for Cable Trenches (m)	0.26	0.13	0.39	Appendix 8.1: Peat Extraction Volumes	

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Additional Peat Excavated (Not Already Accounted for Above)					
Volume of Additional Peat Excavated (m^3)	4,155	3739.5	4570.5	Appendix 8.1: Met mast, substation, welfare building (2), construction compound (4), batching plant.	Value determined from on-site assessment – details presented within Chapter 8: Hydrology and Hydrogeology and associated appendices. 10% Range applied. Only volume or area value required; applying both results in double-counting.
Area of Additional Peat Excavated (m^2)	N/A	N/A	N/A		
Peat Landslide Hazard					
Weblink: Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments	N/A	N/A	N/A	Requirement of Scottish Executive	Assumption that published good practice has been followed to reduce the risk of peat landslides and this source of carbon loss is therefore omitted from the calculations.
Improvement of C Sequestration at Site by Blocking Drains, Restoration of Habitat, etc.					
(1) Improvement of Degraded Bog					
Area of degraded bog to be improved (ha)	200	180	220	Appendix 5.3: Outline Habitat Management Plan	10% Range applied.
Water table depth in degraded bog before improvement (m)	0.20	0.10	0.30	Calculated by project hydrologist.	Value determined from on-site assessment – details presented within Chapter 8: Hydrology and Hydrogeology. 50% Range applied.

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Water table depth in degraded bog after improvement (m)	0.05	0.05	0.05	Estimated from consultation with ecologist and hydrologist	Assumes full restoration as per Appendix 5.3: Outline Habitat Management Plan.
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	10	9	11	Conservative value	10% Range applied. Carbon Calculator Protocol suggests 90% recovery within 6 years (B97).
(2) Improvement of felled plantation land					
Area of felled plantation to be improved (ha)	149	134	164	Appendix 5.3: Outline Habitat Management Plan	10% Range applied.
Water table depth in felled area before improvement (m)	0.50	0.25	0.75	Estimated from consultation with ecologist and hydrologist. Concurs with expected value from Lindsay (2009).	Average assumed water table depth. Forestry varies between dry drainage ditches in excess of 30cm depth and wet areas associated with deep peat. 50% Range applied.
Water table depth in felled area after improvement (m)	0.05	0.05	0.05	Estimated from consultation with ecologist and hydrologist	Assumes full restoration as per Appendix 5.3: Outline Habitat Management Plan.
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	10	9	11	Conservative value	10% Range applied. Carbon Calculator Protocol suggests 90% recovery within 6 years (B97).
(3) Restoration of peat removed from borrow pits					
Area of borrow pits to be restored (ha)	2.16	1.94	2.38	Appendix 5.3: Outline Habitat Management Plan	10% Range applied.

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Water Table Depth in Borrow Pit before Restoration (m)	0.12	0.06	0.18	Calculated by project hydrologist.	Value determined from on-site assessment – details presented within Chapter 8: Hydrology and Hydrogeology. 50% Range applied.
Water Table Depth in Borrow Pit after Restoration (m)	0.12	0.06	0.18	Estimated from consultation with ecologist and hydrologist	
Time Required for Hydrology and Habitat of Borrow Pit to Return to its Previous State on Restoration (years)	10	9	11	Conservative value	10% Range applied. Carbon Calculator Protocol suggests 90% recovery within 6 years (B97).
(4) Removal of drainage from foundations and hardstanding					
Water table depth around foundations and hardstanding before restoration (m)	0.12	0.06	0.18	Estimated from consultation with ecologist and hydrologist	50% Range applied.
Water table depth around foundations and hardstanding after restoration (m)	0.05	0.05	0.05	Estimated from consultation with ecologist and hydrologist	Assumes full restoration as per Appendix 5.3: Outline Habitat Management Plan.
Time to Completion of Backfilling, Removal of any Surface Drains, and Full Restoration of the Hydrology (years)	10	9	11	Conservative value	10% Range applied. Carbon Calculator Protocol suggests 90% recovery within 6 years (B97).

Data	Expected Value	Minimum Value	Maximum Value	Data Source	Assumption / Comment
Restoration of site after decommission					
Will the hydrology of the site be restored on decommissioning?	Yes	Yes	Yes	Appendix 5.3: Outline Habitat Management Plan	
Will you attempt to block any gullies that have formed due to the windfarm?	Yes	Yes	Yes	Appendix 5.3: Outline Habitat Management Plan	
Will you attempt to block all artificial ditches and facilitate rewetting?	Yes	Yes	Yes	Appendix 5.3: Outline Habitat Management Plan	
Will the habitat of the site be restored on decommissioning?	Yes	Yes	Yes	Appendix 5.3: Outline Habitat Management Plan	
Will you control grazing on degraded areas?	Yes	Yes	Yes	Appendix 5.3: Outline Habitat Management Plan	
Will you manage areas to favour reintroduction of species?	Yes	Yes	Yes	Appendix 5.3: Outline Habitat Management Plan	

1.4 Uncertainties and Limitations

1.4.1 There are a number of uncertainties within the model and also from the data inputs used to generate the proposed windfarm payback period. Where uncertainties existed within the data inputs a range of values were input with a suitable sensitivity to produce a realistic range of the payback period.

Forestry

1.4.2 The quality of the forestry on site is poorer than that which is considered by the model following plantation on deep peat. The ranges in the model incorporate sequestration estimates for forestry on peat from the literature, the calculator recommended value for Yield Class 16 forestry in good conditions and the mean of the two values.

1.4.3 The suggested forestry sequestration rate was applied in the maximum value. The model assumes forestry sequesters carbon at a rate of 3.6 tonnes of carbon per hectare per year; however, the literature suggests that forestry planted on deep peat could be a net emitter of carbon dioxide.

1.4.4 Brainard *et al*. (2003) report recent estimates by the Centre for Ecology and Hydrology of the annual carbon emissions of afforested peat areas of 0.3tC/ha, until the total expected carbon loss is realised. The net generation of carbon from afforested peatlands typically arises from the associated drainage regime of deep furrows creating drains designed to lower the water table to permit forestry growth. The lowered water table causes desiccation and oxidative wastage of the peat mass leading to emission of the sequestered carbon. The planned removal of this forestry and effective restoration to bog by raising the water table would halt this process.

Drainage Effects

1.4.5 On-site measurements were used to calculate the drawdown distance from areas of infrastructure associated with peat. The detailed methodology and assumptions are contained within Appendix 8.2.

1.4.6 The extent of drainage effects on peat adjacent to infrastructure is overestimated by the model. Water table drawdown is assessed as being linear within the model whereas in reality drawdown of the water table following installation of infrastructure would be sinusoidal and not as severe as predicted by the model. Assuming a linear relationship provides a permanent dewatered volume of 34,700m^3, an overestimate of 55% compared to actual drawdown curves resulting in 15,700m^3. The worst case has been used within the carbon calculator.

1.5 Sensitivity Analysis

1.5.1 To further understand the impact of sensitive parameters on the results provided by the Carbon Calculator for the overall payback period, a sensitivity analysis has been undertaken using the 'Expected' values and the payback period of the Grid-Mix Payback period. Table 3 below provides the result of this analysis on specified parameters.

1.5.2 Table 3 indicates that the most sensitive parameter is the grid-mix emission factor, particularly where the value is lower than predicted. However, in the absence of specific guidance, the recommended value has been used.

1.5.3 The sequestration rate of timber and water table depth before improvement are also key variables in the analysis. The forestry sequestration rate used to determine the payback period is the mean of the predicted actual value and the Calculator's recommended value. Thus the payback period based on the mean value could be an overestimate; calculation using Brainard *et al*. (2003) data the payback period would reduce to 0.7 years.

1.5.4 Water table depth before improvement has been conservatively assessed with appropriate range values based on data collected on-site. The site data is considered to be robust but since the value is averaged across the site it is possible that the water table depth in degraded bog across the site could be lower than 0.20m and thus a greater carbon benefit would result from the proposed restoration than that predicted by the Calculator. Conversely, it is unlikely that the water table depth in degraded bog would average less than 0.20m.

Table 3 – Sensitivity Analysis on Selected Parameters using the Grid-Mix Payback Period (Years)

Parameter	Payback Period (Grid-Mix) - No Change	Payback Period (Grid-Mix) – Parameter Change -50%	Payback Period (Grid-Mix) – Parameter Change +50%
Average extent of drainage around drainage features at site (m)	1.1	1.0 (-0.1)	1.1 (0)
Average rate of carbon sequestration in timber ($tC\ ha^{-1}\ yr^{-1}$)	1.1	0.9 (-0.2)	1.2 (+0.1)
Grid-mix emission factor ($t\ CO2\ MWh^{-1}$)	1.1	2.1 (+1.0)	0.7 (-0.4)
Water table depth in degraded bog before improvement (m)	1.1	1.2 (+0.1)	0.9 (-0.2)
Water table depth in degraded bog after improvement (m)	1.1	1.1 (0)	1.0 (-0.1)

1.6 Results

1.6.1 The model calculates the carbon emission savings and losses from the various aspects of the model (as described in Table 1) and also calculates a payback period based on the three counterfactual emissions factors; coal fired plant, normal grid-mix and fossil fuel mix.

Table 4 Estimated CO_2 emission savings from proposed Llanbrynmair Windfarm

Counterfactual emission factor	Carbon dioxide saving ($tCO_2\ yr^{-1}$)
Coal-fired electricity generation	132,034
Grid-mix of electricity generation	66,017
Fossil fuel-mix of electricity generation	93,191

1.6.2 Table 4 shows that depending on which energy generation mix is considered, the carbon dioxide savings are estimated to range from approximately 66,000 to 132,000 tonnes CO_2 per year.

1.6.3 Table 5 shows the estimated losses from the various aspects of the windfarm construction and operation under the Expected value assessment. Losses due to turbine life incur 46% of the CO_2 losses with associated payback periods of between five and nine months. Losses from soil organic matter and forestry felling account for 22% and 21% of losses respectively with associated payback periods of between two and four months each depending on the energy generation mix.

1.6.4 Losses due to backup contribute 9% of total losses with a payback period of one month regardless of the energy generation mix.

Table 5 Estimated CO_2 losses from the proposed Llanbrynmair Windfarm – Expected Values

Expected Values	Carbon dioxide losses (t CO_2 eq.)	Payback time (months)		
		Coal Fired	Grid mix	Fossil fuel mix
Losses due to turbine life (e.g. manufacture, construction, decommissioning)	50,444	5	9	6
Losses due to backup	9,631	1	1	1
Losses due to reduced carbon fixing potential	1,844	0	0	0
Losses from soil organic matter	23,663	2	4	3
Losses due to DOC & POC leaching	1,393	0	0	0
Losses due to felling forestry	22,538	2	4	3
Total losses of carbon dioxide	**109,512**	**10**	**18**	**13**

1.6.5 The calculator assumes forest blocks of mature plantation, whereas the majority of the resource to be felled is in poor condition resulting from plantation on deep peat; the losses anticipated by the calculator therefore are likely to represent an overestimate.

1.6.6 Table 6 predicts gains of approximately 30,500tCO_2eq. due to the improvement of the felled forestry area, with an associated reduction in payback time of between three and six months.

1.6.7 Table 6 shows the estimated gains from carbon capture made from improvements to the site. A gain of 7,926tCO_2eq. is predicted through restoration of degraded bogs. Considering the large-scale restoration planned of 200ha the already high water level precludes substantial gains in carbon despite the extensive gains in habitat improvement.

Table 6 Estimated CO_2 Gains Due to Improvements at Site

	Carbon dioxide losses (t CO_2 eq.)	Reduction in payback time (months)		
		Coal Fired	Grid mix	Fossil fuel mix
Gains due to improvement of degraded bogs	-7,926	-1	-1	-1
Gains due to improvement of felled forestry	-30,651	-3	-6	-4
Gains due to restoration of peat from borrow pits	-11	0	0	0
Gains due to removal of drainage from foundations & hardstanding	-22	0	0	0
Total gains of carbon dioxide	**-38,610**	**-4**	**-7**	**-5**

1.6.8 The net emissions of carbon dioxide are estimated at 70,902 tonnes of CO_2 eq. Table 7 shows the overall estimated payback period of the proposed windfarm, based on the three counterfactual emission factors.

Table 7 Estimated payback period of Llanbrynmair Windfarm

Counterfactual emission factor	Estimated payback period of windfarm (in years) Expected	Estimated payback period of windfarm (in years) Minimum	Estimated payback period of windfarm (in years) Maximum
Coal-fired electricity generation	**0.5**	**-0.1**	**1.9**
Grid-mix of electricity generation	**1.1**	**-0.1**	**3.8**
Fossil fuel-mix of electricity generation	**0.8**	**-0.1**	**2.7**

1.6.9 Table 7 shows that depending on which electricity generation emission factor is considered, the payback period is estimated to be between 6 months and 13 months and would subsequently produce a reduction in emissions between approximately 66,000 and 132,000 tonnes CO_2 per year.

1.7 Conclusions

1.7.1 The results show that the proposed windfarm at Llanbrynmair is likely to produce a certain amount of CO_2 emissions, mainly from the construction phase, where carbon-rich soils are excavated to construct foundations, access tracks and other infrastructure. Changes to the hydrology of the site will also cause some losses of carbon from soils. However, the calculations estimate that these losses would be paid back within 6 to 13 months of operation, through displacement of fossil-fuel generated electricity in the National Grid.

1.7.2 The assessment is considered to be conservative; it is probable that the carbon balance will be far more favourable for the proposed windfarm. The carbon losses on site can be further minimised through continued good management practices and maintenance of restored water table levels to continue carbon fixation through regenerating blanket bog habitat.

1.8 References

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1.8.2 Brainard, J., Lovett, A. & Bateman, I. (2003). Carbon Sequestration Benefits of Woodland: Report to Forestry Commission. University of East Anglia.

1.8.3 Countryside Council for Wales (2010). Assessing the Impact of Windfarm Developments on Peatlands in Wales – CCW Guidance Note.

1.8.4 Department for Energy and Climate Change (DECC) (2012). Energy Trends – December 2012.

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1.8.10 Scottish Government (2008). Guidance on how to use the revised carbon calculator spreadsheet which originated from the Scottish Government research publication "Calculating carbon savings from wind farms on Scottish peatlands - A New Approach".

APPENDIX 2.3: PUBLIC EXHIBITION NEWSLETTER

cefnogi'r gymuned, yr amgylchedd a'r economi
Gorffennaf 2008

RES
Renewable Energy Systems

ecollanbrynmair

Mae Renewable Energy Systems UK & Ireland Ltd (RES) yn cyhoeddi cyfres o gylchlythyrau newyddion i roi gwybod i chi am y cynlluniau ar gyfer Fferm Wynt Llanbrynmair... ac i ddiangos y manteision.

Fferm Wynt newydd Llanbrynmair

Mae RES UK & Ireland Ltd, (RES), cwmni sydd â chysylltiadau Cymreig cryf, yn gobeithio codi fferm wynt newydd rhwng pentrefi Llanbrynmair a Llanerfyl er mwyn darparu ynni glân i fwy na 55,000 o gartrefi*.

Dyma'r cyntaf o gyfres o gylchlythyrau newyddion i roi gwybod i chi am y cynllun a'r manteision a ddaw yn ei sgil.

Bydd y fferm wynt yn allweddol wrth leihau nwyon tŷ gwydr a chwrdd â thargedi ynni glân. Bydd hefyd yn dod â budd economaidd i'r ardal ac yn cyfrannu at sicrwydd ein cyflenwad ynni.

Y manylion

Yn ystod y misoedd nesa', bydd RES yn cyflwyno cais cynllunio i godi fferm wynt o 43 thyrbin rhwng pentrefi Llanbrynmair a Llanerfyl yn Sir Drefaldwyn. Uchder y tyrbinau fydd 126.5m i frig y llafnau. Mae'r tyrbinau wedi eu gosod er mwyn cael cyn lleied â phosib o effaith ar y tirwedd tra'n gwneud y gorau o'r gwynt er mwyn cynhyrchu cymaint o ynni ag sy'n bosib.

**Ar sail cei dwedol o 30% o allu cynhyrchu, wedi ei gymryd o ffeuriadau cyffredin gwynt ar y safle hyd yn hyn. Gall y ffigur hwn amrywio yn y dyfodol yn sgil rhagor o ffeithiau ar gyflymder y gwynt. Ystyriwyd fod cartrefi ar gyfartaledd yn defnyddio 4,700kWh y flwyddyn.*

Beth fydd cyfraniad Fferm Wynt Llanbrynmair i'r amgylchedd?

Rhaid amrywio ffynonellau ynni gwledydd Prydain, nid yn unig er mwyn yr amgylchedd ond hefyd er mwyn sicrwydd y cyflenwad. Mae ynni adnewyddadwy'n chwarae rôl allweddol yn yr arallgyfeirio hwn a bydd y fferm wynt hon yn gwneud cyfraniad sylweddol at gyrraedd targedau Llywodraeth y Cynulliad ar gyfer ynni adnewyddadwy.

Bydd y fferm wynt yn diwyn llawer o fanteision amgylcheddol. Mae'n debyg o gynhyrchu digon o drydan i gyflenwi mwy na 55,000 o gartrefi* (sy'n cyfateb i'r holl gartrefi yn Mhowys, yn ôl gwybodaeth Cyfrifiad 2001). Yn ystod ei hoes o tua 25 mlynedd, bydd y fferm wynt hefyd yn arbed gollwng cannoedd o filoedd o dunelli o garbon deuocsid.

Dewch i gwrdd â ni

Bydd arddangosfa gyhoeddus yng Nghanolfan Gymdeithasol Llanbrynmair, ddydd Mercher, 30 Gorffennaf, ac yn Neuadd Bentref Llanerfyl, ddydd Iau, 31 Gorffennaf. Ar y ddau ddiwrnod, bydd yr arddangosfa yn agored o 2pm hyd 8pm.

Gwefan
www.llanbrynmairwindfarm.co.uk

Mae'r wefan hon yn ymwneud yn llwyr â chynllun Fferm Wynt Llanbrynmair. Gallwch ddarllen yn fanylach am y cynllun, gweld mapiau a lluniau gosod o safle'r cynllun a darllen y crynodeb anhechnegol o'n Datganiad Amgylcheddol pan fydd ar gael.

Richard Evans, Rheolwr Cynllun Fferm Wynt Llanbrynmair

Amy Bambridge, Swyddog Cyfathrebu Lleol

Dyma'r Tîm

Richard Evans *yw Rheolwr Cynllun Fferm Wynt Llanbrynmair. Bf sydd wedi goruchwylio pob agwedd ar y cynllun hwn, gan gysylltu gwaith gwahanol adrannau RES i sicrhau fod y safle'n addas, y math iawn o dyrbinau'n cael eu dewis a bod yr holl astudiaethau ac asesiadau angenrheidiol yn cael eu gwneud yn drylwyr. Mae ganddo radd mewn Rheolaeth Coedwigaeth o Brifysgol Aberdeen. Cyn ymuno â RES, roedd yn gweithio i NFU Mutual yn Ne Cymru. Mae Richard yn siaradwr Cymraeg a fagwyd yn ardal Aberhonddu.*

Mae Richard, sydd yn gweithio o swyddfa Cymru RES yng Nghaerdydd, ar gael ar 02920 730307 neu trwy e bostio richard.evans@res-ltd.com

Amy Bambridge *yw Swyddog Cyswllt Cymunedol Ffermydd Gwynt sy'n gweithio o brif swyddfa RES ger Watford. Bywydegydd oedd Amy ond, trwy ei gwaith cynharach ar gynlluniau cymunedol i reoli'r angylchedd, fe drodd at y diwydiant gwynt. Hi sy'n delio â'r holl waith cymunedol lleol a hi yw'r person cyntaf i fynd ati gyda chwestiynau am gronfeydd cymunedol a'r broses ymgynghori.*

Mae Amy ar gael ar 01923 299328 neu trwy e bostio amy.bambridge@res-ltd.com

Pam cael fferm wynt yn Llanbrynmair?

Mae Llanbrynmair oddi mewn i un o'r ardaloedd y mae Llywodraeth y Cynulliad wedi eu dynodi ar gyfer datblygu ffermydd gwynt. Cafodd y rhain eu diogelu yn y nodyn cyngor cynllunio "TAN 8" yn 2005.

Roedd y cyngor cynllunio yn fwriadol yn cyfyngu ffermydd gwynt mawr i safle Ardal Chwilio Strategol yng Nghymru, sy'n addas i gynnyrch 800MW o ynni gwynt (yn cyfateb i 400 o dyrbinau mawr).

Er bod Fferm Wynt Llanbrynmair yn eu cyfarwyddyd oddi mewn i Ardal Chwilio Strategol Coglediol Cymru ac ardal fu fanylach, a ddisgrifiwyd gan Gynghor Sir Powys, ystyrir wedi cynnal arolygon manwl nos gyfnod o ddwy flynedd er mwyn sicrhau fod y cynllun mewn safle addas. Mae ein harolygiadau ân hamlygu wedi ystyried cydymdeithas gwynt, tirwedd, bioamrywiaeth, hedroleg a nifer o ddisgyblaethau eraill gan sicrhau yn sicrhau fod cynllun terfynol y fferm wynt yn llenhau unrhyw effaith negyddol ac yn sicrhau ei bod yn gweddu cymaint ag sy'n bosib i'w amgylchedd.

Mae rhedd gweld casgliadau astudiaethau safle hyn yn ein Datganiad Amgylcheddol, ynghyd ag asesiadau cynhwysfawr o holl effeithiau posib y fferm wynt, yn amgylcheddol a chymdeithasol. Bydd y Datganiad yn cael ei gyflwyno gydâ'n cais cynllunio. Bydd copïau ar gael yn lleol er mwyn ymgynghori.

Y gymuned leol yn elwa

Polisi RES yw fod pob datblygiad fferm wynt yn cynnig manteision amlwg i'r gymuned leol, a bwriad y diwydiant ffermydd gwynt yw sicrhau fod ffermydd gwynt yn cydweddu â bywyd cymunedau lleol gan gynnig iddyn nhw gynifer o fendithion ag sy'n bosib.

Yn achos Fferm Wynt Llanbrynmair, bydd RES yn ymgynghori gydâr gymuned leol i drafod y dewisiadau ar gyfer budd lleol ac er mwyn deall beth fyddai orau i'r ardal arbennig hon.

Cronfa gymunedol yw un o'r dewisiadau i'w hystyried. Byddai'r fferm wynt yn cynnig hyn a hyn o incwm sefydlog pob blwyddyn, ar raddfa sy'n addas i anghenion y gymuned leol. Yn y pen draw, byddai modd trosglwyddo rheolaeth y gronfa i ddwylo corff annibynnol, megis cyngor cymuned (neu grŵp o gynghorau cymuned), neu ymddiriedolaeth newydd gwbl annibynnol. Bydd y math o gorff rheoli yn cael ei ddewis trwy ymgynghori gydâr gymuned leol.

Bydd RES yn ymgynghori gyda chynghorau cymuned a gwleidyddion lleol. Byddem yn annog unrhyw un sydd â barn am y ffordd orau i reoli'r gronfa gymunedol, neu i'w gwario, i ddod i drafod gyda ni ar unrhyw adeg.

Mae RES hefyd yn argymell gwelliannau amgylcheddol i ddiogelu gwerth cadwraeth bywyd gwyllt y fferm wynt ei hun.

Byddwn bob amser yn croesawu awgrymiadau am ffyrdd eraill y gallaîr gymuned leol elwa o'r fferm wynt.

Er mwyn rhoi barn am y syniadau hyn, ffoniwch ni ar 01923 299200, neu e bostiwch llanbrynmair.windfarm@res-ltd.com

Cynllun lleoliad safle Fferm Wynt Llanbrynmair (amlinellad mewn coch)

Cynhyrchwyd yng Nghaerdydd gan StrataMatrix Cyf, ac argraffwyd ar bapur allgychu yn Y Lolfa, Talybont.
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Am ragor o wybodaeth am unrhyw agwedd ar y cynllun, cysylltwch â:
Richard Evans, Rheolwr Cynllun Fferm Wynt Llanbrynmair ar 02920 730307 neu e-bostiwch llanbrynmair.windfarm@res-ltd.com

Trai sy'n derbyn y cylchlythyr hwn trwy'r post, cawsom ateb ar eich cyfeiriad trwy gronfa ddata genedlaethol o godau post. Os nad ydych yn dymuno derbyn rhagor o wybodaeth gennym am y cynllun hwn, ysgrifennwch atom i ddweud.

supporting the community, environment and the economy
July 2008

RES
Renewable Energy Systems

ecollanbrynmair

Renewable Energy Systems UK & Ireland Ltd (RES) is publishing a series of newsletters to let you know all about the proposals for the Llanbrynmair Wind Farm... and to show the benefits.

The new Llanbrynmair Wind Farm

RES UK & Ireland Ltd, (RES), a company with strong Welsh links, hopes to build a new wind farm between the villages of Llanbrynmair and Llanerfyl to provide clean power for more than 55,000 homes*.

This is the first of a series of newsletters which we will publish to let you know about the project and all the benefits it will bring.

The wind farm will be vital for reducing greenhouse gases and meeting renewable energy targets. It will also bring economic benefits to the area and contribute to our energy security.

The details

RES will, over the next few months, be submitting a planning application to build a wind farm of 43 turbines between the villages of Llanbrynmair and Llanerfyl in Montgomeryshire. Each turbine would be no higher than 126.5m to the tip of the blade. The layout of the turbines has been designed to have as little effect as possible on the landscape while making the most of the wind to capture as much energy as possible.

**Based on a conservative capacity factor of 30%, derived from wind speed measurements on site to date. This figure may change in the future as further wind speed monitoring data becomes available. An average household electricity consumption figure of 4,700kWh/year was used in this calculation.*

What will the Llanbrynmair Wind Farm do for the environment?

Britain's energy supply needs to diversify, not just for environmental reasons, but also to ensure the security of our supply. Renewable energy is playing a vital role in this diversification, and this wind farm will make a significant contribution to the Welsh Assembly Government's targets for renewable energy.

The wind farm will bring many environmental benefits. It is likely to generate sufficient electricity to power over 55,000 homes* (equivalent to all of the homes in Powys, based on UK 2001 Census data). The wind farm will also save hundreds of thousands of tonnes of CO_2 over its lifetime of approximately 25 years.

Come and meet us

There will be a public exhibition on Wednesday 30th July at Llanbrynmair Community Hall and on Thursday 31st July in Llanerfyl Village Hall. The exhibitions on both days will be open from 2pm to 8pm.

Website
www.llanbrynmairwindfarm.co.uk

This website is specifically dedicated to the Llanbrynmair Wind Farm proposal. You can read about the project in more detail, look at maps and photomontages of the proposed site, and read the non technical summary of our Environmental Statement when published.

Richard Evans, Llanbrynmair Wind Farm Project Manager

Amy Bambridge, Local Communications Officer

Meet the Team

Richard Evans is the Llanbrynmair Wind Farm Project Manager. He has been overseeing every aspect of this proposal, coordinating the various departments of RES to ensure the site is suitable, the right turbines are chosen and that all the necessary studies and assessments are carried out thoroughly. He has a degree in Forestry Management from Aberdeen University. Before joining RES he worked for NFU Mutual in South Wales. Richard is a Welsh speaker who was raised in the Brecon area.

Richard, who is based in RES's Welsh office in Cardiff, is available on 02920 730307 or email richard.evans@res-ltd.com

Amy Bambridge is the Wind Farm Community Relations Officer, based at the RES head office near Watford. Originally a biologist, Amy's previous work on community environmental management projects led her into the wind industry. She handles all of the local community work and is the first point of contact for enquiries about community funds and the consultation process.

Amy is available on 01923 299328 or email amy.bambridge@res-ltd.com

Why a windfarm at Llanbrynmair?

Llanbrynmair is within one of the Welsh Assembly Government's designated areas for wind farm developments. These were set out in the planning guidance note "TAN8" in 2005.

The planning guidance deliberately restricted large wind farms to seven 'Strategic Search Areas' in Wales which are designed to accommodate 800MW (equivalent to 400 large turbines) of wind power.

Although the Llanbrynmair Wind Farm is situated wholly within the Cambrian Mountains Strategic Search Area and the smaller refined area described by Powys County Council, we have undertaken detailed surveys over 2 years to ensure the proposal is well-sited. Our surveys and studies have considered wind speeds, landscape, biodiversity, hydrology and a range of other disciplines and have ensured the final design of the wind farm minimises potential impacts and is as sympathetic as practicable to the surrounding environment.

The culmination of these site studies, along with comprehensive assessments of all potential impacts of the wind farm, both environmental and social, can be found in our Environmental Statement, which will be submitted with our planning application. Copies will be made available locally for consultation.

Bringing local community benefits

It is RES policy to ensure that each wind farm development brings tangible benefits to the local community, and it is the aim of the wind farm industry to ensure that wind farms are complementary to the lives of local communities, bringing them as many benefits as possible.

For the proposed Llanbrynmair Wind Farm, RES will be consulting with the local community to discuss the options for local benefits and to understand which may be best for this particular area.

One of the options to be considered is a community fund. The wind farm would provide a fixed amount of annual income, at a rate to be discussed with local people. The fund could be ultimately handed over to an independent body to manage, such as a community council (or a group of community councils), or an entirely new independent trust. The identification of a suitable management body will be decided in consultation with the local community.

RES will be consulting with local politicians and community councils. We would encourage anyone with a view on how the community fund should be managed or spent to discuss this with us at any time.

RES is also proposing environmental improvements to enhance the wildlife conservation value of the wind farm itself.

We always welcome suggestions for other ways in which local people could benefit from the wind farm.

To comment on these ideas, please phone us on 01923 299200, or email llanbrynmairwindfarm@res-ltd.com

Llanbrynmair Wind Farm site location plan (outlined in red)

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For more information about any aspect of the project, please contact
Richard Evans, Llanbrynmair Wind Farm Project Manager on 02920 730307 or email llanbrynmairwindfarm@res-ltd.com

For those receiving this newsletter by post, we obtained your address through a national post-code database. If you do not wish to receive further information from us about this proposal, please write to us and let us know.

APPENDIX 3.1: TECHNICAL DETAILS OF BONUS 2.3MW TURBINE AND VESTAS 2MW TURBINE

APPENDIX 4.1 TECHNICAL DETAILS OF SIEMENS 2.3MW TURBINE AND VESTAS 2MW TURBINE

Outstanding Performance

Siemens Wind Turbine SWT-2.3-93

Power Generation Wind Power

SIEMENS

Outstanding quality

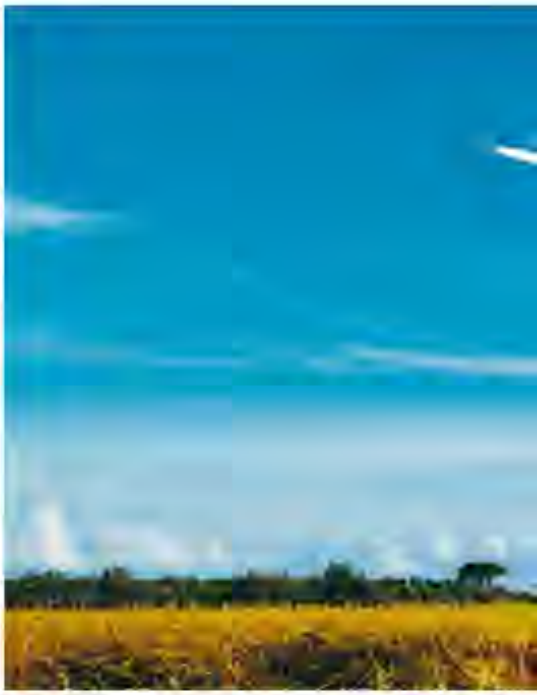
Contents

Based on more than 25 years of leading-edge design and construction, it is suitable for almost any type of application, both onshore and offshore. A rugged, conservative structural design, automatic lubrication systems with ample supplies, climate control of the internal environment and a simple generator system without slip rings provide exceptional reliability at long service intervals. Power conversion is implemented with Siemens' unique NetConverter® system, offering maximum flexibility in the turbine response to voltage and frequency control, fault ride-through and output adjustment.

Major components, such as the rotor hub, the main shaft, the gearbox and the yaw system are all of particularly heavy dimensions and all details are designed using best engineering practice.

As a result, we offer the new SWT-2.3-93 wind turbine, providing outstanding quality and best-in-class technical features.

Technical description



General design

The SWT-2.3-93 wind turbine is an upgraded version of the standard SWT-2.3-82 machine and includes the new B45 blade, a rotor diameter of 93 m, and hence a 25 percent increase of the swept area relative to the standard version of the SWT-2.3-82 wind turbine.

Rotor

The SWT-2.3-93 turbine has a three-bladed rotor with pitch regulation for power output optimization and control. The rotor speed is variable in order to maximize the aero-dynamic efficiency, and speed compliance during power regulation minimizes the dynamic loads on the transmission system.

Blades

The B45 blades are made of fiberglass-reinforced epoxy in Siemens' proprietary IntegralBlade© manufacturing process. In this process, the blades are cast in one piece, leaving no weak points at glue joints and providing optimum quality.

The aerodynamic design represents state-of-the-art wind turbine technology, and the structural design has special Siemens safety factors over and above all normal industry and customer requirements.

Rotor hub

The rotor hub is cast in nodular cast iron and is fitted to the main shaft with a flange connection. The hub is large enough to provide a comfortable working environment inside the structure for two service technicians during maintenance of bolt connections and pitch bearings.

Blade pitch system

The blade pitch arrangement is used to optimize and regulate power output through the operating range. The blades are feathered to minimize wind loads during standstill under extreme wind conditions.

Main shaft and bearing

The main shaft is forged in alloy steel and is hollow for the transfer of power and signals to the blade pitching system. The main shaft is supported by a self-aligning double spherical roller bearing, grease lubricated from an automatic lubrication system. The bearing seals are maintenance-free labyrinth seals.

Gearbox

The gearbox is a custom-built, three-stage planetary-helical design. The planetary-helical, high-torque stage provides a compact high-performance construction. The intermediary and high-speed stages are normal helical stages arranged with an offset of the high-speed shaft and thus allowing passage of power and control signals to the pitch systems. The gearbox is equipped with large-capacity cooling and filtering systems that ensure optimum operating conditions.

Generator

The generator is a fully-enclosed asynchronous machine with squirrel-cage rotor, which does not require slip rings. The generator rotor construction and stator windings are specially designed for high efficiency at partial loads. The generator is internally ventilated and cooled with an air-to-air heat exchanger.

Mechanical brake

The mechanical brake represents the secondary safety system of the turbine. It is fitted to the gearbox high-speed shaft and has two hydraulic calipers.

Yaw system

The yaw bearing is an externally geared ring with a friction bearing. Eight electric planetary gear motors drive the yawing. The yaw gear motors are fitted with brakes, assisting the passive friction of the bearing for stable maintenance of the yaw position.

Controller

A standard industrial computer is the basis of the turbine controller. The controller is self-diagnosing and includes a keyboard and display for easy status readout and adjustment of settings.

Power conversion

The NetConverter® power conversion system allows generator operation at variable speed, frequency and voltage while supplying power at constant frequency and voltage to the MV transformer. The power conversion system is a modular arrangement for easy maintenance.

Tower

The SWT-2.3-93 turbine is mounted on a tapered tubular steel tower. The tower can be fitted with a personnel hoist as an option.

Operation

The wind turbine operates automatically, self-starting when the wind reaches an average speed of about 3 - 5 m/s. During operation below rated power, the pitch angle and rotor speed are continuously adjusted to maximize the aerodynamic efficiency. Rated power is reached at a wind speed of about 13 - 14 m/s, and at higher wind speeds the output is regulated at rated power. Speed compliance during power regulation minimizes the dynamic loads on the transmission system. If the average wind speed exceeds the maximum operational limit of 25 m/s, the turbine is shut down by feathering of the blades. When the wind drops back below the re-start speed, the safety systems reset automatically.

Remote control

The SWT-2.3-93 turbine is equipped with the unique WebWPS SCADA system. This system offers remote control and a variety of status views and useful reports from a standard Internet Web browser. The status views present electrical and mechanical data, operation and fault status, meteorological data and grid station data. Primary level users can be granted access to any of the server's features, including full control over the turbines.

Turbine Condition Monitoring

In addition to the WebWPS SCADA system, the turbine is equipped with a Web-based Turbine Condition Monitoring (TCM) system. The TCM system carries out precise condition diagnostics on main turbine components continuously and in real time. It gives early warning of possible component failures by continuous comparison of current vibration spectra with previously established reference spectra. The TCM system has various alarm levels, from informative through alerting level to turbine shutdown.

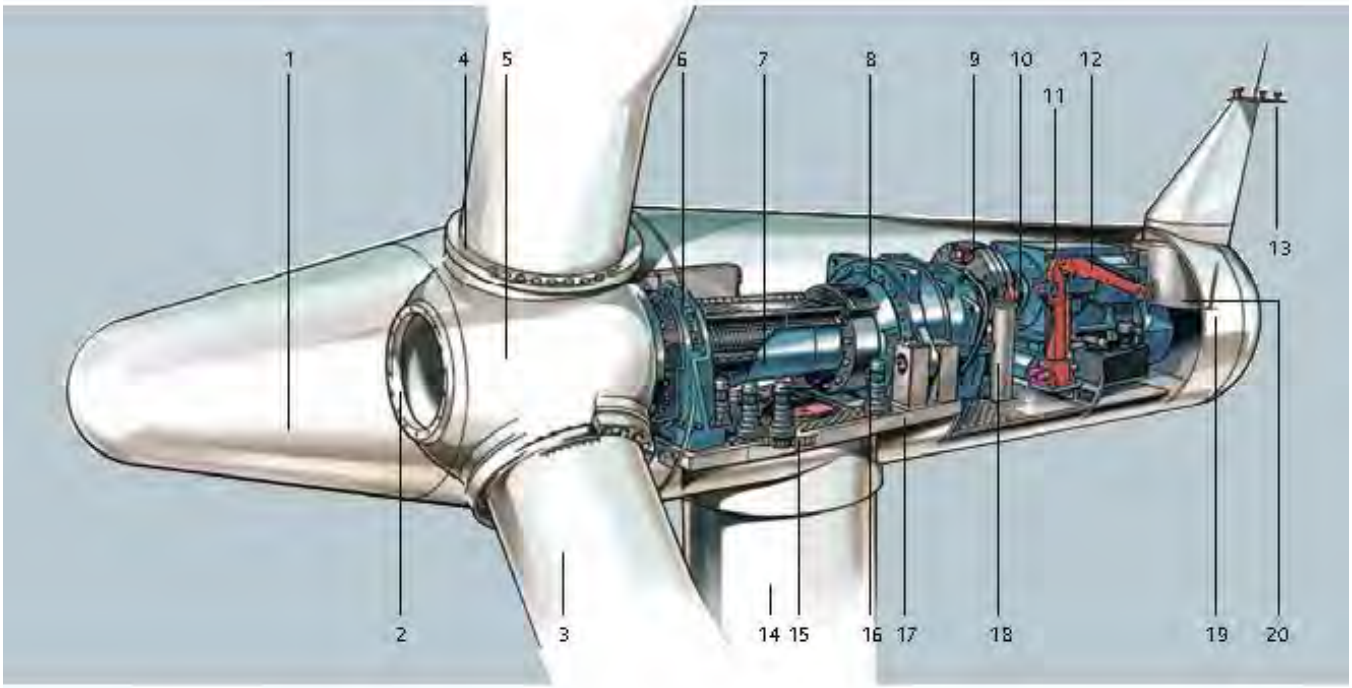
Grid compliance

The SWT-2.3-93 turbine complies with all currently valid grid code requirements on relevant markets. Voltage and frequency control and other grid-related adjustments can be implemented by the integrated Park Pilot facility in the WebWPS SCADA system, and the turbine has ride-through capability for all normal faults.

Rotor	
Diameter	93 m
Swept area	6,800 m²
Rotor speed	6-16 rpm
Power regulation	Pitch regulation with variable speed
Blades	
Type	B45
Length	45 m
Aerodynamic brake	
Type	Full span pitch
Activation	Hydraulic, fail-safe
Transmission System	
Gearbox type	3-stage planetary/helical
Gearbox ratio	1:91
Gearbox oil filtering	Inline and offline
Gearbox cooling	Separate oil cooler
Oil Volume	Approx. 400 l
Mechanical brake	
Type	Fail-safe disc brake

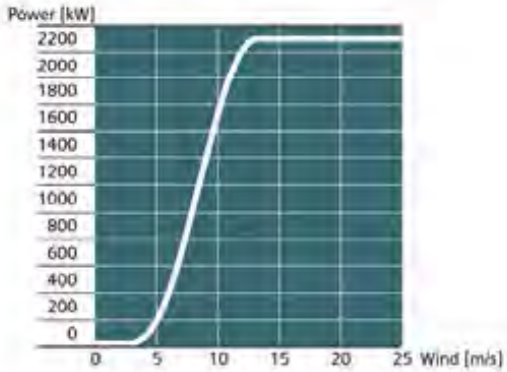
Generator	
Type	Asynchronous
Nominal power	2,300 kW
Voltage	690 V
Cooling system	Integrated heat exchanger
Yaw system	
Type	Active
Monitoring system	
SCADA system	WebWPS
Remote control	Full turbine control
Tower	
Type	Cylindrical and/or tabered tubular
Hub height	60 m, 80 m or site-specific
Operational data	
Cut-in wind speed	3 - 5 m/s
Nominal power at	13-14 m/s
Cut-out wind speed	25 m/s
Maximum 2 s gust	55 m/s (standard version) 60-80 m/s (special version)
Weights	
Rotor	60 tons
Nacelle	82 tons
Tower	Site-specific

6



Sales power curve

The calculated power curve data are valid for standard conditions of 15 °Celsius air temperature, 1013 mBar air pressure and 1.225 kg/m³ air density, clean rotor blades, and horizontal, undisturbed air flow. The calculated curve data are preliminary.



Nacelle arrangement

1. Spinner
2. Spinner bracket
3. Blade
4. Pitch bearing
5. Rotor hub
6. Main bearing
7. Main shaft
8. Gearbox
9. Brake disc
10. Coupling
11. Generator
12. Service crane
13. Meteorological sensors
14. Tower
15. Yaw ring
16. Yaw gear
17. Nacelle bedplate
18. Oil filter
19. Canopy
20. Generator fan

7

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91058 Erlangen, Germany

Siemens Wind Power A/S
Borupvej 16
7330 Brande, Denmark

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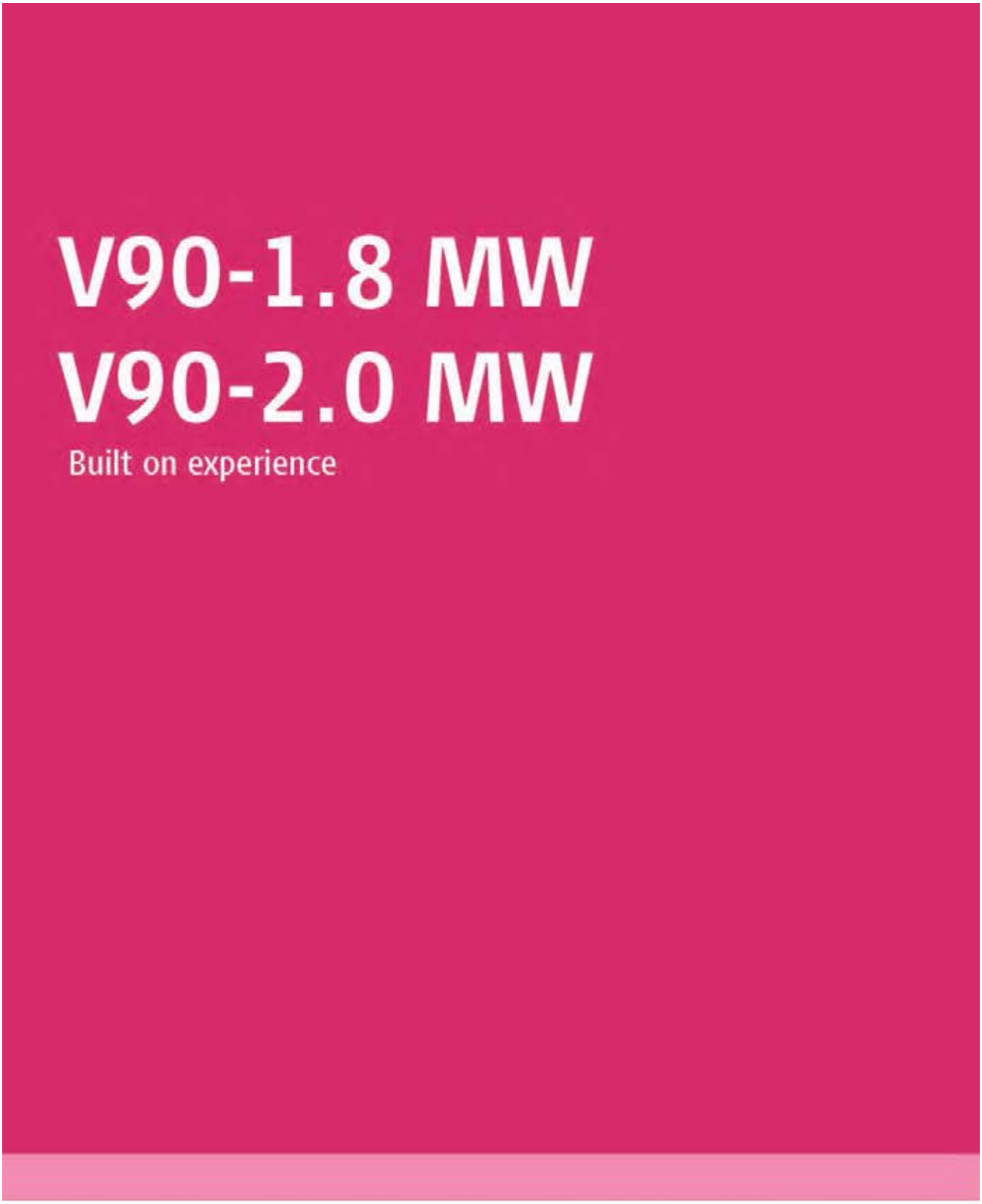

V90-1.8 MW
V90-2.0 MW
Built on experience
Vestas
No.1 in Modern Energy

Innovations in blade technology

Optimal efficiency

The OptiSpeed®* generators in the V90-1.8 MW and the V90-2.0 MW have been adapted from those in Vestas' highly successful V80 turbine. OptiSpeed® represents a significant advance in wind turbine efficiency as it allows the rotor speed to vary within a range of approximately 60 per cent in relation to nominal rpm. This means that with OptiSpeed®, the rotor speed can vary by as much as 30 per cent above and below synchronous speed. Its purpose is simple: to maximise energy output.

It does this by tapping the higher efficiency of slow and variable rotation, storing excess energy in rotational form and exploiting the full force of transient gusts. All told, OptiSpeed® boosts annual energy production.

As an added benefit, OptiSpeed® also reduces wear and tear on the gearbox, blades and tower on account of lower peak loading. Moreover, as turbine noise is a function of wind speed, the lower rotation speeds made possible by OptiSpeed® naturally reduce sound levels.

Finally, OptiSpeed® helps our V90s deliver better quality power to the grid, with rapid synchronisation, reduced harmonic distortion and less flicker.

3x44 metres of leading edge

Vestas blades have always been among the lightest on the market, and with the V90 turbines, we have once again raised the bar. The new blades feature several new light-weight materials, most notably carbon fibre for the load-bearing spars. Not only is carbon fibre lighter than the fibre glass used in previous blades, but its strength and rigidity have also made it possible to reduce the amount of material required. This means that even though our V90s have 27 per cent more swept area than our V80s, the longer blades actually weigh about the same.

The V90 blades also have a new profile that is aerodynamically superior to the previous generation. Vestas engineers developed this technologically advanced profile by optimising the relationship between the overall load impact on the turbine and the power generated annually. The fruit of their labours was an entirely new plane shape and a curved back edge.

The resulting airfoil improves energy production, while making the blade profile less sensitive to dirt on its leading edge and maintaining a favourable geometrical relationship between successive airfoil thicknesses. For the V90 turbine, this translates into an increase in output combined with a decrease in load transfers - as well as improvements on the bottom line.

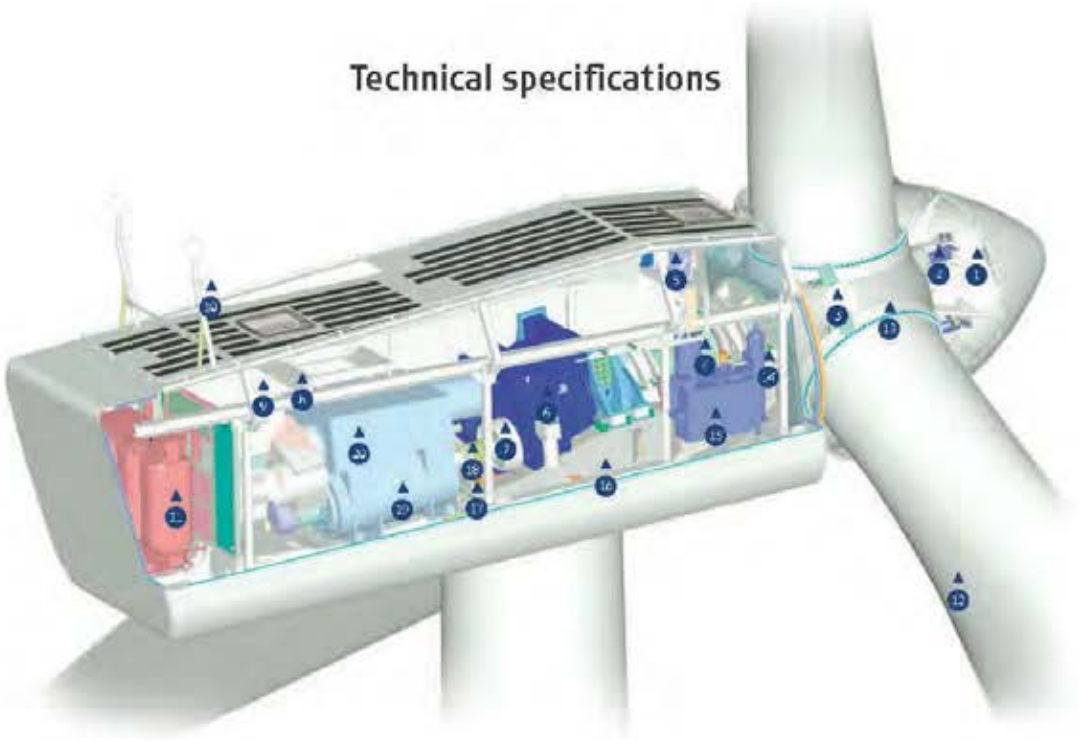
Proven Performance

Wind power plants require substantial investments, and the process can be very complex. To assist in the evaluation and purchasing process, Vestas has identified factors that are critical to wind turbine quality: energy production, power quality and sound level.

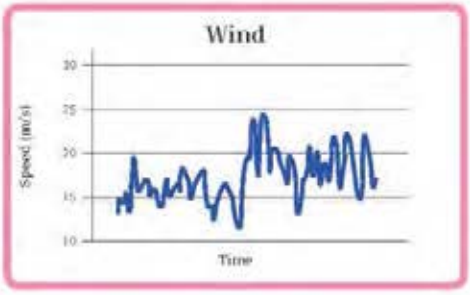
We spend months testing and documenting these performance areas for all Vestas turbines. When we are finally satisfied, we ask an independent testing organisation to verify the results - a practice we call Proven Performance. At Vestas we do not just talk about quality. We prove it.

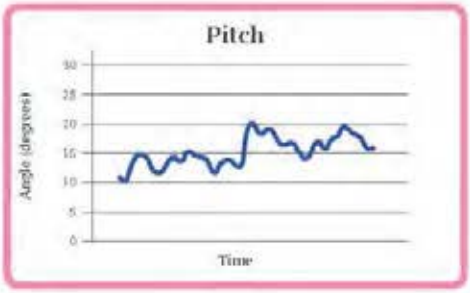
** Vestas OptiSpeed® is not available in the USA and Canada*

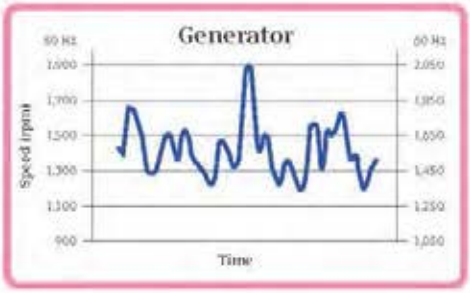
Technical specifications

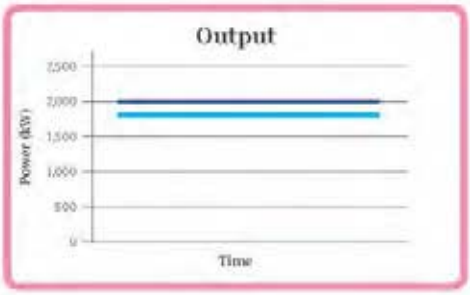


1 Hub controller
2 Pitch cylinders
3 Blade hub
4 Main shaft
5 Oil cooler
6 Gearbox
7 Mechanical disc brake
8 Service crane
9 VMP-Top controller with converter
10 Ultrasonic wind sensors
11 High voltage transformer
12 Blade
13 Blade bearing
14 Rotor lock system
15 Hydraulic unit
16 Machine foundation
17 Yaw gears
18 Composite disc coupling
19 OptiSpeed® generator
20 Air cooler for generator









OptiSpeed® allows the rotor speed to vary within a range of approximately 60 per cent in relation to nominal rpm. Thus with OptiSpeed®, the rotor speed can vary by as much as 30 per cent above and below synchronous speed. This minimises both unwanted fluctuations in the output to the grid supply and the loads on the vital parts of the construction.

Rotor

Diameter:	90 m
Area swept:	6,362 m²
Nominal revolutions:	14.9 rpm
Operational interval:	9.0-14.9 rpm
Number of blades:	3
Power regulation:	Pitch/OptiSpeed®
Air brake:	Full blade pitch by three separate hydraulic pitch cylinders.

Tower

Hub height:	80 m, 95 m, 105 m

Operational data

	IEC IIA: 1,800 kW	IEC IIIA/DIBt II: 2,000 kW
Cut-in wind speed:	3.5 m/s	2.5 m/s
Nominal wind speed:	12 m/s	13 m/s
Cut-out wind speed:	25 m/s	25 m/s / 21 m/s

Generator

	IEC IIA:	IEC IIIA/DIBt II:
Type:	Asynchronous with OptiSpeed®	Asynchronous with OptiSpeed®
Nominal output:	1,800 kW	2,000 kW
Operational data	50 Hz/60 Hz 690 V	50 Hz/60 Hz 690 V

Gearbox

Type:	Planetary/helical stages

Control

Type:	Microprocessor-based control of all the turbine functions with the option of remote monitoring. Output regulation and optimisation via OptiSpeed® and OptiTip® pitch regulation.

Weight

Nacelle:	68 t
Rotor:	38 t

Towers:

Hub height:	IEC IIA	IEC IIIA	DIBt II
80 m	150 t	150 t	-
95 m	200 t	-	200 t
105 m	-	-	225 t

t – metric tonnes

DIBt towers are only approved for Germany

All specifications subject to change without notice.

Built on experience

State-of-the-art wind turbines are not developed in a vacuum. To create the new V90-1.8 MW and V90-2.0 MW turbines for low and medium wind, we have drawn on the vast experience gained as the leading supplier of wind energy systems in the world. In particular, we applied successful design elements from our existing range of turbines.

We began with the nacelles of our tried and tested V80 wind turbines, which feature OptiSpeed® generators for maximum productivity. To these, we fitted the revolutionary new blades from our high-wind V90-3.0 MW. We then modified the components to ensure optimal harmonisation and to make the very most of the target conditions.

The resulting V90-1.8/2.0 MW turbines are optimised for sites with low turbulence and low and medium winds. These innovative wind turbines are so successful that they can actually generate 25 per cent more energy than the corresponding V80s.

Naturally, the new integrated turbines feature innovations of their own innovations. For instance, Vestas engineers spent two years designing a more efficient and more robust gearbox. Moreover, while the 90-metre rotor weighs approximately the same as the V80 rotor, the longer blades mean higher loads, so we also reinforced the transmission and other major components of the V90.

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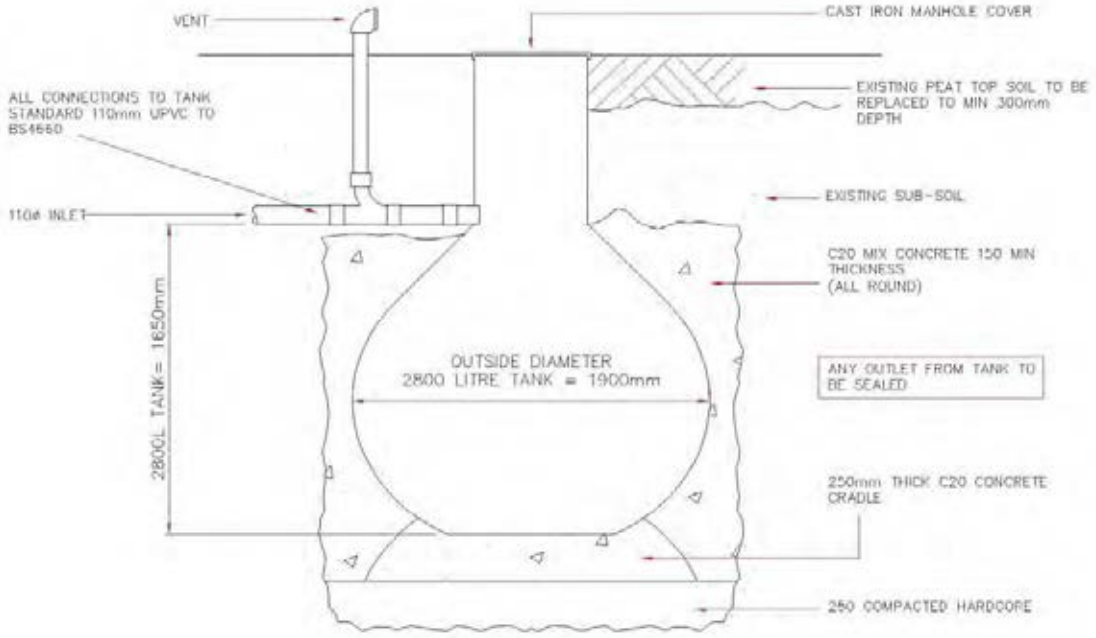
To see a complete list of our sales and service units, visit www.vestas.com

01/08 UK

APPENDIX 3.2: CESSPIT ARRANGEMENT

1.1.1 Due to the minimal usage of the control building toilet and wash basin at any wind farm site RES propose the use of a sealed cesspit. The drawing below shows a cesspit arrangement. RES have cesspit systems in operation at several wind farm sites and systems have been functioning as intended without problems (for around 5 years at the Lendrums Bridge wind farm in Northern Ireland), and have proved satisfactory as an appropriate technology level for a remote situation.

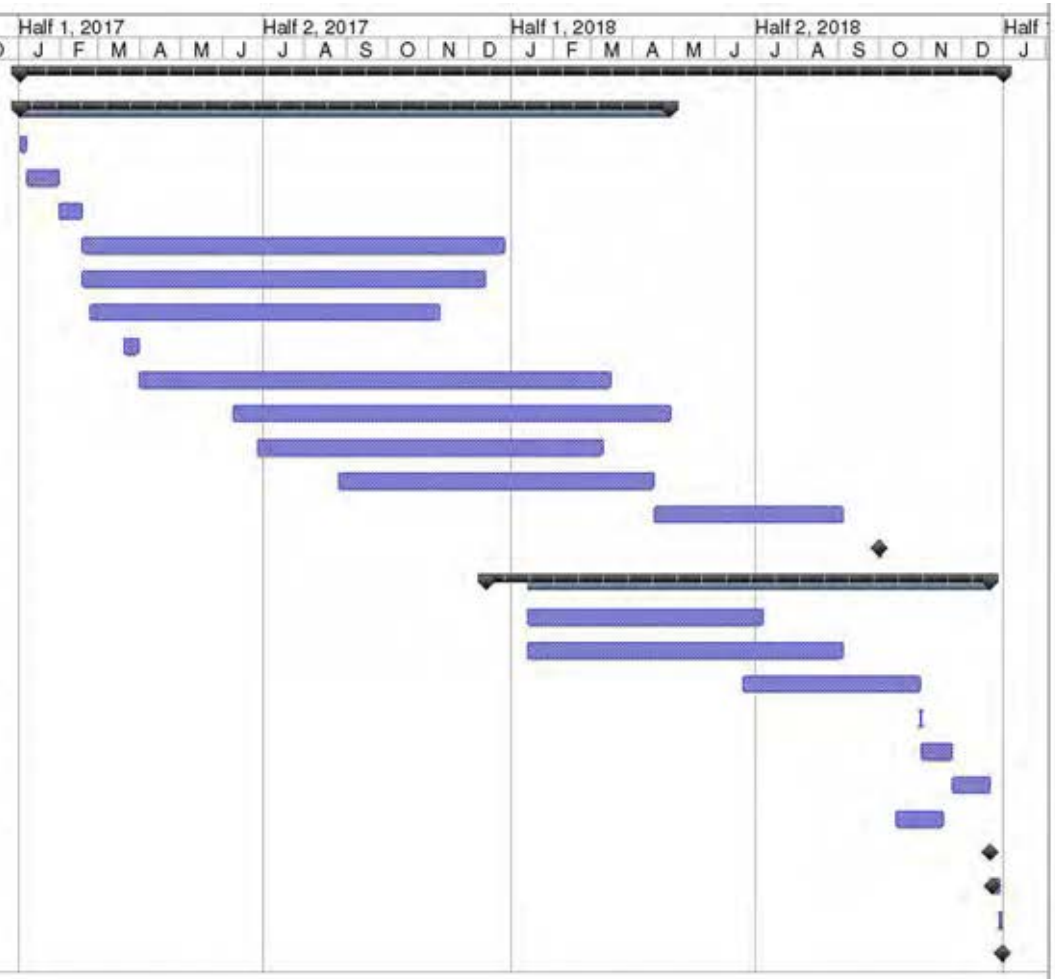
1.1.2 The cesspit would be emptied when required by a licensed waste carrier.



SECTION THROUGH A TYPICAL CESS PIT

APPENDIX 3.3 – CONSTRUCTION PROGRAMME

ID	Task Name	Start	Finish
1	**Construction Works**	**Mon 02/01/17**	**Mon 31/12/18**
2	**Civil Works**	Mon 02/01/17	Sat 28/04/18
3	Mobilise	Mon 02/01/17	Fri 06/01/17
4	Construct Site Entrance	Sat 07/01/17	Mon 30/01/17
5	Establish Site Compound	Tue 31/01/17	Thu 16/02/17
6	Construct SUDS Drainage	Fri 17/02/17	Tue 26/12/17
7	Construct New Site Track	Fri 17/02/17	Tue 12/12/17
8	Upgrade Existing Site Track	Thu 23/02/17	Wed 08/11/17
9	Establish Batching Plant	Mon 20/03/17	Thu 30/03/17
10	Turbine Foundations	Fri 31/03/17	Thu 15/03/18
11	Hardstandings	Fri 09/06/17	Sat 28/04/18
12	Cable Track Installations	Tue 27/06/17	Fri 09/03/18
13	Construct Substation	Sat 26/08/17	Mon 16/04/18
14	Electrical Works	Tue 17/04/18	Mon 03/09/18
15	Assumed Grid Availabilty Date	Mon 01/10/18	Mon 01/10/18
16	**Turbines**	Thu 14/12/17	Fri 21/12/18
17	Delivery	Sat 13/01/18	Fri 06/07/18
18	Erect Turbines	Sat 13/01/18	Mon 03/09/18
19	Electrical & Mechanical Fit Out	Fri 22/06/18	Tue 30/10/18
20	Energise Turbines	Wed 31/10/18	Wed 31/10/18
21	Commission Turbines	Thu 01/11/18	Fri 23/11/18
22	240hr Testing	Sat 24/11/18	Fri 21/12/18
23	SCADA	Sat 13/10/18	Fri 16/11/18
24	Complete TSA	Sat 22/12/18	Sat 22/12/18
25	Clear Site	Mon 24/12/18	Fri 28/12/18
26	Produce H&S File	Sat 29/12/18	Sat 29/12/18
27	Completion Date EPC	Mon 31/12/18	Mon 31/12/18



APPENDIX 3.4: RES EMERGENCY PREPAREDNESS AND RESPONSE AND SPILLAGE PROCEDURES

1.1 Introduction

1.1.1 RES use an Environmental Management System (EMS) in accordance with the ISO14001 standard. The EMS identified activities that RES undertakes that may have an effect on the environment; preventative and improvement procedures have been put in place to address these activities and are used on RES construction and operational wind farm sites.

1.2 Environmental Emergency Preparedness and Response Plan

1.1.3 The RES Environmental Emergency Preparedness and Response Plan provides guidance to RES staff and subcontractors working on RES construction and operational wind farm sites.

1.1.4 The Plan details the system for the identification of, potential for, and response to, environmental accidents and emergency situations occurring on a RES construction or operational wind farm site; in order that the environmental impacts can be prevented or mitigated for.

1.1.5 In the event of an environmental emergency occurring on a construction or operational wind farm site, the member of RES staff or subcontractor who noticed the emergency will follow the work instruction put in place to address the situation e.g. oil spills; this will provide guidance on contacting SEPA or the EA for further advice on dealing with the emergency.

1.2 Emergency Procedure in the event of a spillage

1.2.1 This procedure details the emergency procedure to be followed and actions to be taken in the event of an oil, fuel and chemical spill occurring on a RES wind farm construction site or an operational wind farm site.

1.2.2 Spill kits of appropriate form and size for the controlled substances being used are supplied on site; they are also present on any mobile refuelling bowsers on construction sites. In the event of a spill occurring on a wind farm construction or operational site trained personnel shall immediately deploy the spill kit in accordance with the manufacturer's instructions. Used spill kits and any other contaminated material e.g. rags used during the incident are disposed of in accordance with the Environmental waste management regulations, by a licensed disposal company and waste transfer certificates retained. The EA or SEPA will be informed of the incident and further advice sought if required.

APPENDIX 3.5: RES ENVIRONMENTAL REQUIREMENTS FOR CONTRACTORS

1.1 Introduction

1.1.1 This document identifies environmentally safe working procedures and standards for particular operations that must be implemented by all subcontractors when working on a site managed by RES. The procedures have been developed to ensure that RES and all its subcontractors comply with Environment Agency and SEPA Pollution Prevention Guidelines, and additional planning requirements set out by the Local Planning Authority and other enforcing bodies. As part of the procedure an environmental checklist has been created, which is completed on site every 2-3 weeks by the site manager. Detailed below is the scope of the procedures contained within the document, and a brief summary of what is required of the subcontractors on-site.

Existing Features

Contaminated land

1.1.2 Any remediation or disposal of contaminated land will only be carried out following consultation with the local environmental authority, if no work is required on the contaminated land it will be fenced off to prevent disturbance.

Underground services

1.1.3 Assessment of the hazards for underground services where present shall include an assessment of the environmental impact of damage during construction

Existing storage tanks

1.1.4 Any old containers found on site will be checked and emptied by a Licensed Waste Carrier before removal. Copy of licence certificate will be obtained and handed to RES site manager for inclusion in Project Health and Safety File.

Protection from vandalism

1.1.5 Vandalism, theft and tipping are common causes of pollution and the compound area should be adequately protected by fencing and locked to discourage unauthorised access. Any occurrence of tipping on the site will be reported to site management who will inform the local environmental authority and the police if necessary

Site Drainage

Surface and foul water drains

1.1.6 Surface water drains should carry uncontaminated rainwater only and shall be protected from ingress of silt, or any other contaminants. Wet cement and raw concrete shall never be allowed to enter any watercourse

Deliveries

Fuels and oils

1.1.7 Fuel and oil deliveries shall take place within the designated refuelling area only; a responsible person will supervise site deliveries to ensure that the correct amount of material is delivered to the correct tank and that the level is checked prior to refilling to avoid spillage

Storage of Fuels, Oils and Chemicals

1.1.8 All fuels and oils will be stored in a designated area only, including mobile bowsers when not in use. Generators permanently stationed in site compound (used for powering site cabins) will be kept in the designated refuelling area, or be bunded (the bund shall be capable of containing 110% of the fuel tank's capacity) or shall have a double skinned fuel tank. Chemicals on site will be stored in accordance with their COSHH assessment and appropriate spillkit kept by subcontractor.

Security

1.1.9 All bowsers will be stored so as to minimise the risk of collision, run-away and vandalism. They will not be stored adjacent to watercourses. When not in use, bowsers will be securely stored in the designated refuelling area.

Marking

1.1.10 The contents of any tanks on site will be clearly marked. Warning notices including "No smoking" and "Close valves when not in use" shall also be displayed

Removal

1.1.11 No tanks or containers may be perforated or dismantled on site. A competent operator will empty all contents and residues for safe disposal elsewhere.

Waste management

Treatment and storage

1.1.12 All waste will be stored in designated areas that are isolated from surface drains, prior to removal from site.

1.1.13 Skips will be covered to prevent refuse blowing away and rainwater accumulating. They will be replaced when full and the contents disposed of in accordance with statutory requirements

Disposal

1.1.14 Chemical containers, used oil and filters, solvents, paints, electrical items, contaminated materials and hazardous refuse are all classified as "special waste" and, as such, will be stored in a bunded area away from watercourses and disposed of by licensed contractors in a controlled manner.

Earthworks

Dealing with silty water

1.1.15 Silty water can arise from excavations, exposed ground, stockpiles, wheel-washing and site roads and water containing silt will not be discharged directly into rivers, streams or surface water drains.

1.1.16 Wherever possible, silty water should be avoided. However, where is does occur it is vital that the silt that is held in suspension is allowed to settle out before the water reaches a watercourse.

1.1.17 Drainage treatments during the construction phase of a wind farm vary in cost, complexity and appropriateness. Several solutions RES may adopt for dealing with silty water are presented here:

1.1.18 Flat grassed area - Where the topography allows, existing grassed depressions are ideal for the natural filtration of run-off containing silt. However it is important to ensure that water issuing onto such areas is not causing erosion en route, and also that the volume of silt being deposited in the settlement area is tolerable.

1.1.19 Sumps - A sump dug prior to any site drainage reaching an existing watercourse will act as a settlement lagoon. The level of accummulated silt should be monitored and lowered through controlled removal (such as a sludge tanker) when necessary. Series of sumps may be necessary to deal with larger discharges.

1.1.20 **Settlement/separation tanks -** These proprietary tanks operate on the same principle as the sump. Their performance is often enhanced by the inclusion of a baffle which prevents water overshooting the settlement tank, as shown below. This baffle arrangement has the added advantage of acting as an oil separator in the event of such pollution reaching the tank. Sophisticated separators, or interceptors, which monitor the silt/oil level trapped are availabile. The tank size, layout and number of baffles can all be selected to identify the most appropriate arrangement.

Excavations

1.1.21 Where possible, water will be prevented from entering excavations. Use of cut-off ditches and well point de-watering may be necessary. Water discharged by any pumping arrangement will be dealt with according to the site drainage plan

Topsoil Stripping and Reinstatement

1.1.1 It is of paramount importance to minimise disturbance to flora and fauna whilst carrying out the construction works, and to ensure that disturbed habitats will regenerate quickly after completion of the works. Topsoil and vegetation (stored separately from subsoil) will be retained and reinstated over the track shoulders and all other areas of stripped ground, as soon as possible to prevent erosion and leaching.

1.1.2 On wet and marshy ground it may be necessary to store excavated materials on a geotextile in order to minimise disturbance to the vegetation below.

Exposed ground and stockpiles

1.1.3 The total quantity of exposed ground and stockpiles, and storage duration will be minimised in order to minimise generation of silt and dust. If long-term storage is required then stockpiles can be seeded or covered and silt fences constructed from a suitable geotextile. In dry weather dust suppression measures may be required.

Plant

Refuelling

1.1.4 Where possible, mobile plant will be refuelled in the designated area. Where plant is to be refuelled outside this area a double skinned bowser must be used and re-fuelling will take place over a drip tray. Refuelling shall always take place away from watercourses or surface drains.

Maintenance

1.1.5 Plant and site vehicles are to be well maintained and any vehicles leaking fluids must be repaired or removed from site immediately. Any servicing operations will take place over drip trays.

Road Cleanliness

Site Roads

1.1.22 Site Roads will be brushed or scraped as required to minimise dust and mud deposits, especially at site entrances and any watercourse crossings. If necessary during dry weather, dust suppression may be achieved by spraying water onto the site tracks to dampen down the airborne dust particulate.

Public Highways

1.1.23 Measures will be undertaken throughout the construction phase of the wind farm to ensure that dust and mud does not migrate onto the adjacent public highways, private roads or accesses. This may require the establishment of a wheel washing station comprising an apron onto which vehicles will drive in order to clear the wheels and undersides using a power washer. Any water used during the wheel washing process will be collected and passed through a silt trap before discharging into a

soakaway. Run off water will be channelled via a silt trap into a purpose made soakaway and will not be discharged directly into watercourses.

Drip Trays

1.1.24 After use the drip tray will be cleaned using an appropriate absorbent material which will be disposed of in accordance with COSHH regulations. Drip trays will be regularly checked and cleaned.

Concrete

1.1.25 Concrete is highly alkaline and corrosive and can have a detrimental impact on watercourses. Washing-out of concrete wagons on site will not be permitted, unless in a designated sealed wash-out pit. No tools, equipment or materials will be washed in watercourses. Mortar mixing and material storage areas must be away from watercourses.

1.1.26 Sulphate resistant concrete shall be used where geological conditions dictate, to prevent long term corrosion of concrete (local release of alkaline compounds) due to sulphate attack.

Wildlife

1.1.27 Wildlife shall be protected from entering and becoming trapped in any part of the works on the site. For excavations this may mean that fences, crossings or escape routes are necessary.

APPENDIX 3.6: RES SUDS DESIGN PHILOSOPHY

1.1 Sustainable Drainage System (SUDS)

1.1.1 RES will appoint a SUDS Designer to undertake a detailed sustainable drainage design for the proposed wind farm site. The outline design philosophy statement presented here explains the rationale behind the SUDS proposals that have been developed for the proposed infrastructure required for the wind farm.

1.1.2 The main objectives of the Statement include the following:

- Propose appropriate, robust and buildable SUDS techniques for the prevention of erosion and the removal of silts from the runoff.
- Provide a sustainable drainage specification for the construction phase of the development.

1.1.3 Details on the timings, temporary works, and site drainage and pollution prevention measures which would be incorporated as part of the SUDS are described below.

1.1.4 The assessment also identifies construction and post construction maintenance requirements.

1.2 Relevant Guidance and Legislation

1.2.1 It is proposed that all drainage relating to the wind farm will be constructed using best practice and in conformance with the requirements of Environment Agency and other regulatory authorities. The key legislation and guidance which will be adhered to in the development of the SUDS design are defined as follows:

- EA Pollution Prevention Guidance Notes (PPGs):
    - PPG 1 General guide to the prevention of water pollution;
    - PPG 2 Above Ground Oil Storage Tanks;
    - PPG 5 Works in, near or liable to affect watercourses;
    - PPG 6 Working at construction and demolition sites;
    - PPG 21 Pollution incident response planning. o PPG23 Maintenance of structures over water;
- Industry Guidance Documents:
    - CIRIA Report C502 Environmental Good Practice on Site;
    - CIRIA 522 - Sustainable Urban Drainage Systems; Design Manual for England and Wales;
    - CIRIA Report C532 Control of Water Pollution from Construction Sites;
    - CIRIA Report C648 Control of Pollution from Linear Construction Project. Technical Guidance;
    - CIRIA Report C650 Environmental good practice on site;
    - CIRIA Report C651 Environmental good practice on site checklist;
    - CIRIA Report C609 - SUDS - hydraulic structural & water quality advice o CIRIA Report C697 – The SUDS Manual.
- Forestry Commission, Forests and Water, 4th Edition;
- BS6031:1981 Code of Practice for Earth Works;
- DEFRA Good Practice Guide for Handling Soils (MAFF 2000);

- Water Order 1999;
- The Surface Waters (Dangerous Substances) (Classification) Regulations 1998;
- The Private Water Supplies Regulations;
- UK Water Quality (Water Supply) Regulations 2001;
- Groundwater Regulations 1998
- Control of Pollution Act 1974
- UK Water Quality (Water Supply) Regulations 2000
- EC Fisheries Directive (78/659/EEC)
- Land Drainage Act 1991
- Water Framework Directive (2000/60/EC).

1.3 Design Criteria

1.3.1 The design criteria for the SUDS are:

- Minimise any change to the hydrology and groundwater conditions within the site. We propose the use of source control to deal with water close to where it hits the ground, rather than conveying it for long distances to large balancing ponds. Under the ethos of SUDS it is proposed, where physically possible, to replicate natural drainage in the area;
- Minimise sediment loads in the runoff, with particular attention being given to the construction phase of the project;
- Maintain runoff rates and volumes at Greenfield rates for a range of storm events;
- Where appropriate, treatment facilities will be designed to offer a retention time of between 24 and 48 hours;
- Incorporate additional pre-settlement ponds on internal drains, which will not only provide extra settlement capacity, but also offer better control over the transport of sediment through the site;
- Avoid high flow velocities, particularly at the entry point to the final settlement pond. Energy dissipation devices or multiple outflow structures will help avoid the re-suspension of sediment;
- The drainage system should manage problems of erosion and provide for reinstatement of vegetation along the access track;
- Ensure that the runoff discharged from the site is in compliance with Fisheries Act and EC Freshwater Fish Directive (78/659/EEC).

1.3.2 These design criteria can then be translated into an outline design philosophy.

1.4 SUDS Design Philosophy

1.4.1 In order to meet the design criteria the following philosophy has been developed.

1.4.2 Road and hard-standing runoff will be handled by sheet flow to the side ditches or swales. The cross-fall on the road will be aligned in the downhill direction in line with the natural hydrology of the site. The slope from the road/hard-standing to the ditch will be suitably profiled to reduce the volume and rate of runoff and prevent erosion. Any vegetation used will be appropriate to the local area. Hardstandings and tracks will be constructed from aggregate and will not be surfaced, thus helping to reduce runoff volumes. This has been allowed for within the design philosophy through the utilisation of a reduced runoff coefficient of 75%, and a heavy silt loading assumed as defined by D'Arcy et al (2000), for light industrial and engineering land uses.

1.4.3 The ditches (swales) will be primarily used to hold water temporarily and to encourage infiltration / discharge into the ground locally to where the rainfall hits the ground. This avoids concentrating large volumes of water into point discharges. This will be achieved through the provision of small check dams at approximately 40m centres along the swales. The stone used for the construction of the check dams will be 20mm 'clean' graded stone. On steeper slopes the check dams will be reinforced using larger 100mm stone placed on the downhill side of the dam to prevent washing away of the small stones. The check dams will serve dual functions, both removing and settling out silts and reducing flow velocities, therefore mitigating against the effects of erosion within the swale.

1.4.4 Also, swales will provide a flow route in extreme events to carry water to the existing surface water channels across the site.

1.4.5 Trackside drainage will empty into spillways placed at regular intervals along the channels. This method will decrease both the net dewatering of the area and the amount of additional flow entering the watercourses.

1.4.6 Under-track drainage will be provided with associated sumps and check dams. The under-track drainage will provide a means for flows to pass from a swale on the uphill side of the slope to the downhill side of the slope. Where the track runs tangential to the fall of the slope the under track drainage will assist in balancing flows between the swales on either side of the access road.

1.4.7 Small balancing ponds will be required for the majority of turbine locations. Where practicable the number of ponds will be rationalised. The general location of the small balancing ponds should ensure that they pose minimal health and safety risk to site personnel, particularly whilst constructing the wind turbine rotors during the installation process (as this process takes place adjacent to the crane hard standing).

1.4.8 All swales and ponds will be kept as shallow as possible. Maximum depth of standing water will be limited to 0.5m within the ponds and 0.3m within the swales.

1.4.9 The use of large balancing ponds will be avoided and there will be no merit in using other methods such as filter drains or hard permeable surfacing due to the lack of infiltration capacity and high groundwater levels across the site

1.4.10 The level of silt in runoff during construction will be monitored and if it is excessive in any area this can be managed by providing straw bales locally around the problem areas. These will filter the runoff and trap silt.

1.4.11 Field drains/streams will be piped directly under the track through appropriately sized drainage pipes. Where appropriate a lateral drainage ditch will be cut along the uphill side of the track to intercept the natural runoff. This lateral drain will be drained under the track at regular intervals through correctly sized cross drains to the downhill side of the access track.

1.4.12 Where appropriate, a second lateral drainage ditch on the other side of the road will catch runoff from the track itself. Flows from this ditch will be treated by filtration through check dams, settlement at sumps and filtration through geotextile attached to the inlet end of the discharge pipes.

1.4.13 In cases where the tracks must run significantly downhill, transverse drains ('grips') will be constructed where appropriate in the surface of the tracks to divert any runoff down the road into the drainage ditch.

1.4.14 Where burn or stream crossings cannot be avoided, the design of the crossing, either culvert or bridge, shall be prepared in line with Environment Agency guidelines.

1.4.15 Appropriate site management measures will be taken to ensure that runoff from the construction site is not contaminated by fuel or lubricant spillages. Earth spillages into any existing streams will also be avoided. There will be no discharge of trade effluent, sewage effluent or contaminated drainage into any watercourse system or ditch. Any dewatering

from excavations will be via surface silt traps to ensure sediment does not enter surrounding watercourses.

1.4.16 Silt runoff from stockpiles and excavated spoil heaps will be contained through the placement of geotextile silt fences (or straw bales) on the downhill side of the stockpile.

1.4.17 The proposed SUDS design provides a surface water management train that will mitigate any adverse impact on the hydrology and hydrogeology of the site and surrounding areas.

1.5 Detailed Considerations

1.5.1 If swale calculations show excessive flow velocity (> 1.5m/s) and negligible residence time (<10mins) along the steeper gradients of the access road, check dams will be incorporated into the design to slow flow velocities down and prevent erosion and to enhance treatment. Check dams will still be provided along the shallower and 'flat' sections of the access road to intercept silts at source.

1.5.2 It is proposed that rock filled dams will be used as part of the SUDS system. The 20mm crushed rock should be locally won, and will constitute the majority of the check dams. On steeper slopes these dams will be protected from washing away with the placement of larger stone (>100mm) on the downhill side of the check dam. It is noted that it may not be possible to produce sufficient volume of stone within the borrow pits of sufficient quality or grading to construct the check dams for the site. It is intended that these dams will be relatively simple and cost effective to construct and therefore correctly specified stone may need to be imported from off site.

1.5.3 Geo-textile filtration dams will be utilised should the requirement arise upon the agreement of the SUDS designer and Site Engineer. These dams will only be installed at locations of the site which have been identified as particularly sensitive to silt runoff. It is noted that the dams would require regular maintenance during the construction phase and would be removed completely on completion of the construction phase where silt within the runoff has significantly reduced. The geo-textile filtration dams would be installed after a series of stone check dams.

1.5.4 There will be regular outflow points (spillways) from the swales throughout the SUDS system to eliminate the potential of the generation of large flows and to maintain / mimic the natural hydrological response displayed by the catchment. Spillway points would be formed by providing a notch through the embankment on the downhill slope side of the access road. Where it is not possible to form a notch, a length of polypropylene pipe will provide the means of discharge through the embankment. Where possible, these outflows will be directed away from watercourses, to increase the drainage path to the watercourse.

1.5.5 Figure 4.12 details the typical long section and cross sections and plan view for the stone check dams, swales and discharge points.

1.5.6 For the turbine hard-standings, drainage will be by swales to mini settlement ponds. These will either infiltrate the water to the ground or discharge over open vegetated areas across the site. A typical turbine base hard-standing area and associated access road will require 25m3 of storage. Typical cross section and plan views for the settlement ponds are also detailed in Figure 4.12.

1.6 Recommendations for Construction of SUDS

1.6.1 It is highlighted that the road layout design and SUDS design have been developed to minimise and mitigate for the effects of pollution to all local watercourses. However, this does not remove all environmental responsibilities from the contractor / sub-contractors. All site personnel will be made aware of their environmental responsibilities at the site inductions and by detailed method statements/risk assessments.

1.6.2 This section of the report outlines the steps which should be undertaken during the construction phase of the project to ensure compliance with the relevant guidance and

legislation outlined above. Site visits by the SUDS designer will be undertaken at various stages of the construction process to ensure that the proposed SUDS scheme is being constructed in line with the design.

1.6.3 In accordance with BS6031: 1981 Code of Practice for Earth Works, land disturbance will be kept to a minimum and disturbed areas will be stabilised as soon as possible. Soil handling will be undertaken with reference to best practice guidelines available from DEFRA in the form of the Good Practice Guide for Handling Soils (MAFF 2000). In principal, soil excavation will be undertaken during dry periods where reasonably practicable. However, it is noted that due to other factors such as bird nesting season and fish spawning season, most of the work at the site will be undertaken during autumn / winter periods and therefore working only during dry weather may not always be practicable or feasible.

1.6.4 Essential mitigation measures relevant to controlling erosion and runoff from construction of the SUDS are described in Environment Agency's Pollution Prevention Guidance and Special Requirements.

1.7 Working in the Vicinity of water / Buffer zones

1.7.1 The following recommendations apply to the general construction activities either within the watercourses or in the vicinity of watercourses.

- Ensure roads are built to the layout design and therefore remain outside the relevant buffer zones to rivers and watercourses;
- Minimise construction near streams in wet weather;
- Avoid using acidic, metal or sulphide-rich spoil from mine workings for road construction;
- Plan so that roadside drains do not discharge directly into watercourses, but rather through a buffer area of adequate width (see below);
- Keep cement and raw concrete out of watercourses;
- Runoff from excavations will NOT be pumped directly to watercourses.

1.7.2 Following the advice of the Forest and Water Guidelines 4th Edition (Forestry Commission 2004) the following buffer zones will be implemented for watercourses that are not sensitive in terms of fisheries, spawning areas or extraction points being located downstream.

> *"In terms of providing adequate protection for the aquatic zone, a width of 20 m on either side will generally suffice for larger watercourses with a channel more than 2 m wide. A minimum buffer width of 20 m should also be left along the shore of lakes and reservoirs. For small streams, practical constraints mean that the minimum buffer widths should be 10 m on either side for channels 1–2 m wide and 5 m on either side of channels up to 1 m wide (unless highlighted as being important for fish spawning when a minimum buffer width of 10 m should also apply to either side of channels less than 1 m wide)."*

1.7.3 Where there are important fish spawning areas, fisheries or abstraction points located downstream, the stated buffer zones will be increased by a factor of two. It is noted that treatment techniques will be utilised to remove silts from all contaminated runoff prior to the discharge of flows over the open vegetated areas.

1.7.4 Buffer zones will be designated using a drainage management plan for the site, which will be developed as part of the Construction Management Statement for the site.

1.8 Watercourse Diversions

1.8.1 The following procedure will be followed for the installation of any minor watercourse diversions located across the site.

- The diversion channel must be excavated leaving a plug at each end so that the existing watercourse does not breach into the diversion channel in an uncontrolled way;
- Compact the diversion channel bed, and use a geotextile layer to provide a non-erodable surface as required;
- Open the downstream plug first, allowing some water to flow back up the diversion channel;
- Then open the upstream plug;
- Place a non-erodable dam (i.e. compacted earth with a geotextile layer over the top) in the upstream part of the old channel to direct all flows into the diversion channel;
- Place a non-erodable dam in the downstream part of the old channel, preventing backflow.

1.9 Water Crossings

1.9.1 Recommendations have been made for the undertaking of fish surveys at all water crossing locations to establish the presence of migratory fish. For the installation of minor water crossings where it has been proven through survey that migratory fish are not present, the following procedure should be followed:

- Place a filtration check dam downstream of the proposed works;
- Provide cut-off channels at the top of the banks to divert flows away from the proposed water crossing area;
- Prepare the channel bed, and use a geotextile layer to provide a non-erodable surface.
- Put the stone surround and culvert in place;
- Backfill with specified stone materials;
- Provide erosion protection at the inlet and outlet points to the culvert;
- Provide bunds along either side of the top of the crossing to ensure that runoff does not discharge directly into the watercourse;
- Remove the infiltration check dam upon completion of construction activities and when there is no longer a risk from silt pollution;
- It should be noted that major water crossings will be designed on a bespoke basis. Each water crossing will be sized to convey a 1 in 100 year return period flood event and designed to suit the specific requirements and constraints of its location. The details of all main water crossings and diversions will be submitted to Environment Agency to obtain all necessary consents and in general will follow the construction procedure outlined above.

1.9.2 Should there be any incidents of pollution to the watercourses Environment Agency would be notified immediately. Immediate steps will be undertaken to resolve the cause of the pollution.

1.10 Swales /Access Roads

- Scheduling construction activities to minimise the area and period of time that soil will be exposed, particularly during winter periods;
- Installation of cut-off drains around the working areas to intercept uncontaminated surface runoff and divert it around and away from the works;
- Minimising the stockpiling of materials and locating essential stockpiles as far away as reasonably practicable from watercourses;

- Keep drains and culverts clear of debris and maintain silt traps. Do not dump spoil within buffer areas;
- Carry out drains maintenance only in dry weather after September and consider leaving undisturbed sections or using straw bales to act as temporary sediment traps;
- Ensure that road cambers are adequate and rutting is kept to a minimum;
- Avoid erosion of embankments and, where possible, maintain a vegetation cover;
- Inspect roads, drains and silt traps for damage after intense storms and also before and after any intensive use;
- Minimise using quarry dust as a surface dressing for roads;
- Geo-textile will be fixed to the inlet end of some discharge pipes to act as an additional stage in the treatment process. Geo-textile will only be fixed around the inlet of pipes where the discharge location is deemed to be sensitive or the primary treatment stages (check dams and settlement sumps) have not been fully effective;
- Where a geo-textile filter has been fixed to the inlet end of a discharge pipe, this will be checked regularly and replaced if required. Geo-textile filters will be removed at the end of the construction phase or whenever the levels of silt within the runoff have significantly reduced.

1.11 Mini-Settlement Ponds

- Installation of cut-off drains around the working areas to intercept uncontaminated surface runoff and divert it around and away from the works; surface water runoff may also be diverted around the excavation using heavy timbers or similar laid on the surface of the ground;
- Minimising the stockpiling of materials and locating essential stockpiles as far away as possible from watercourses;
- Inspect mini-settlement ponds for damage after intense storms, in particular at the entry point and around the forebay area;
- Mini settlement ponds are to be in-filled and the surrounding area fully rehabilitated post construction phase. Construction waste materials such as generated silts and gabion baskets should be disposed of in an appropriate manner.

1.12 Turbine Bases and Crane Pads

- Installation of cut-off drains around the working areas to intercept uncontaminated surface runoff and divert it around and away from the works; surface water runoff may also be diverted around the excavation using heavy timbers or similar laid on the surface of the ground;
- Minimising the stockpiling of materials and locating essential stockpiles as far away as possible from watercourses;
- The base of the excavation will be constructed level, and water will be gathered in a sump, and pumped at a low flow rate into either the mini-settlement pond or road swale;
- If pumping of flows to a SUDS feature is not feasible or the rate of flow is too high then flows will be collected and pumped out to the downhill side of the excavation over an area of flat land and well away from watercourses;
- If the downhill slope is steep a shallow trench will be dug parallel to contour lines, to ensure it filters into the soil layers. The trench will be in-filled with the excavated material after completion of the turbine base;

- The foundation working areas will be re-vegetated as soon as practical after construction.

1.13 Substation, Temporary Compounds and Borrow Pits

- During construction of the substation and temporary compounds, similar measures to those implemented during turbine/crane pad construction will be used to limit water ingress, sediment erosion and concrete pollution. Particular care will be taken during the construction of infrastructure situated on peaty soils to prevent dewatering of the surrounding soils and prevent soils slumping during excavation;
- Cut-off drainage channels around compounds will direct water away from the construction site in order to prevent water entering foundation excavations or carrying sediment away from the site.

1.14 Cable Trenches

- To minimise impacts from disturbance, cables will be laid in small trenches along the side of access tracks as far as possible;
- The trenches will be dug during drier periods, if practical, and any spoil material will be temporarily placed on the uphill slope to reduce the likelihood of runoff entering the excavations;
- The electric cables will be quickly placed within the trenches and soils replaced to minimise the ingress of water into the trenches;
- Temporary silt traps will be provided in the longer trench runs and on steeper slopes;
- Swale slopes are to be correctly reinstated post infilling of the cable trench.

1.15 Proposed Road Construction

- Any runoff containing soil from construction will flow to track-side drainage channels (dug as tracks are constructed). Permanent drainage structures will be constructed as soon as is practical after the construction of a stretch of road.

1.16 General Programme for Installation of SUDS / Decommissioning of Selected SUDS Features

Installation

1.16.1 Where feasible the SUDS will be constructed prior to, or at the same time as the access roads.

1.16.2 Where work carried out to construct the swales and check dams in advance of the construction of the access road is likely to cause increased detriment or adverse environmental impacts to the hydrological processes of the site; under such circumstances the SUDS system will be constructed after the access road and interim measures such as the placement of straw bales will be employed.

1.16.3 Suitable prevention measures will be in place at all times to prevent the conveyance of silts to receiving water courses.

1.16.4 Before runoff is allowed to flow through the swales, surety must be given by the contractor that the swales are fully stabilised and will not be affected by erosion. This will prevent the erosion of the sides and the base and clogging of other parts of the system by the silt that is generated. Where there is likelihood that the swales could be affected by erosion, the base of the swale should be lined with a layer of geo-textile. Where feasible, the side slopes and base of the swale should be reinstated with vegetated sods which should be removed and stored as part of the excavation process.

Decommissioning

1.16.5 Some of the main treatment SUDS features are fundamental for the effective treatment of surface runoff flows during the construction phase. It is proposed that once the site has been completed and silt entrained within the runoff has been reduced to negligible levels, that some of the SUDS features will be decommissioned.

1.16.6 The following items have been considered as the main activities of work to be undertaken after the main construction activities for the wind farm site have been completed and all silt levels entrained within the runoff have reduced to negligible levels.

1.16.7 **Activity -** Mini settlement ponds are to be in-filled and the surrounding area fully rehabilitated post construction phase. Construction waste materials such as generated silts and gabion baskets would be disposed of in an appropriate manner.

1.16.8 **Reason –** Leaving the settlement ponds in place may pose a longer term health and safety risk to grazing livestock. Once all construction activities in the area have ceased and silt levels within the runoff have significantly reduced there should no longer be a requirement for the ponds.

1.16.9 **Activity –** Sumps along the access road are to be infilled with large open voided stone. Construction waste materials such as generated silts should be disposed of in an appropriate manner.

1.16.10 **Reason –** As with the ponds the main operation of the sumps will be during the construction phase. By infilling the sumps with large open voided stone, all health and safety issues will be removed whilst still retaining some settlement ability.

1.16.11 **Activity –** Removal of Geo-textile from inlet end of pipes. Geo-textile will be fitted to the inlet end of discharge pipes to act as an additional stage in the treatment process. Geo-textile will only be placed around the inlet of pipes where the discharge location is deemed to be sensitive or the primary treatment stages (check dams and settlement sumps) have not been fully effective. Removed sections of geo-textile and lengths of rope used to fix the geo-textile should be disposed of in an appropriate manner.

1.16.12 **Reason –** Geo-textile has a tendency to clog over time when used for this type of application. As with the ponds and sumps the main requirement will be during the construction phase. Removal will ensure that the inlet ends of discharge pipes are not blocked off, which could lead to flooding of the access roads.

1.16.13 **Activity –** Re-vegetation of foundation and crane pad working areas as soon as possible after construction of the turbine. A layer of geo-textile should be laid over these surfaces prior to the re-soiling and vegetation, to ensure that these materials can be easily removed, should it become necessary to gain access to the crane pad for maintenance purposes in the future. A sufficient area of the crane pad should be left uncovered to allow for dry access for maintenance personnel to and from the turbine and also to allow for the turning of maintenance vehicles.

1.16.14 **Reason** – To reduce the volume of runoff from the hard-standing areas around the site, the top layer of soil and vegetation can be scraped off at a later date should the crane hard standing areas be required. A layer of geo-textile will allow for suitable separation of the vegetative materials from the underlying stone sub-base.

1.17 SUDS Maintenance Manual – Recommendations during Construction / Post-Construction Phase

Recommendations during Construction Phase

1.17.1 This report will serve as the primary SUDS System maintenance manual for the construction phase. As part of the working relationship the SUDS Designer will operate with RES, regular site inspections are arranged during the construction phase of the wind farm, in order for

SUDS designer to validate that the SUDS specification is being adhered to by the contractor and to make additional recommendations where potential problems are identified.

1.17.2 In addition to the site inspections carried out by the SUDS Designer, the following construction inspections will be undertaken by the site engineer during the construction phase of the project.

- All Check dams and mini-settlement ponds to be checked at least once fortnightly via a walkover survey during the full period of construction. All excess silts to be removed and disposed of as agreed with Environment Agency. Where check dams have become full blocked with silt, they would be replaced.

1.17.3 Procedure for replacement of the check dam is as follows:

- Silt deposits to be removed from the upstream side of check dams;
- Removed silt to be disposed of by spreading in an area of the site where surface runoff will not convey silt deposits back to a water course;
- The existing 20mm stone check dams are to be removed and disposed of appropriately. Stone materials removed from the check dams should not be disposed of over vegetated areas of the site;
- Replacement check dam to be installed using 20mm stone;
- Where there are regular incidents of check dam blockage, further check dams to be installed (every 15-20m intervals) within the swales;
- Soil in the swales should not be smeared or compacted so that permeability is reduced;
- All excavations are to the required size and gradient and located in correct position;
- Ensure side slopes are correct;
- Ensure depth of excavation is correct;
- Any excavated materials should be placed in such a manner that any instability of excavated materials will not cause infilling of the swale;
- Debris (e.g. loose roots) to be removed from the base of the swale;
- If, during the course of developing the site, the Engineer uncovers a watercourse not previously evident, he should advise the local Environment Agency office immediately in order that arrangements may be made for investigation and direction in respect of any necessary measures required to deal with the watercourse. However, finding of further watercourses is viewed as unlikely, with a full hydrological survey having been carried out on the site;
- Should there be noticeable effects of erosion along the swales or at discharge points, suitable erosion protection measures such as placement of large stones or reno mattresses should be installed at the area affected.

Recommendations during construction / post construction phase

1.17.4 This section of the report will serve as the primary SUDS System maintenance manual for the post construction phase. It is recommended that a post construction inspection programme be implemented, with a walk over site visit to be undertaken on an ongoing 6-monthly basis (winter and summer preferably). Points to be considered during these inspections are as follows:

- No excess silting from construction phase or post construction. - Check dams and mini settlement ponds to be checked twice yearly on an ongoing basis. Where stone check dams have become clogged with silt, the check dam should be removed and replaced, subsequent to the removal of silt.

- Procedure for replacement of the check dam is as follows:
    - Silt deposits to be removed from the check dams.
    - Removed silt to be disposed of by spreading in an area of the site where surface runoff will not convey silt deposits back to a water course.
    - The existing 20mm stone check dams are to be removed and disposed of appropriately. Stone materials removed from the check dams should not be disposed of over vegetated areas of the site.
    - All new check dams to be installed using 100mm stone.
    - Further check dams to be installed (every 15-20m intervals) within the swales along any steeper sections of the access road.
    - No excessive erosion or bare areas of planting. - Should there be noticeable effects of erosion at discharge points, suitable erosion protection measures such as reno-mattress or placement of large stones (>150mm) to dissipate water energy levels should be installed at the area affected.
    - Any materials excavated should be placed in such a manner that any instability of excavated materials will not cause further infilling of a swale or drainage feature.
    - Inlets and outlets of cross drainage pipes are to be free from silt and debris. All litter to be removed from discharge points / outlets and inlets / outlets to be operating correctly.
    - A maintenance record log should be maintained for all maintenance work carried out. Where problems persist on each six-monthly inspection, advice should be sought from the SUDS designer on an alternative drainage solution.

1.17.5 It is the long term objective of the SUDS design that the swales become fully vegetated. Should, over the course of the ongoing post construction inspection programme, it be found that over 30% of the swale along any part of its length be bare of vegetation, reseeding or planting should be considered to achieve 80-90% coverage. Vegetation of areas worst affected by lack of take up from vegetation may be assisted with the placement of an erosion control blanket or the use of bare earth as a temporary cover during the wetter seasons. Areas should be seeded with a suitable grass mix as soon as the weather is conducive to seed germination. A suitable grass seed mix **must** be agreed with the local Environment Agency ecologist. It is noted that not all wind farm sites will be suitable for reseeding.

APPENDIX 3.7 – LAYOUT JUSTIFICATION

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
Entrance 4		None	Existing entrance and track	No peat at this location
Entrance 4 to 1st Junction	Track	None	Follows existing track to minimise footprint in Curlew area.	No peat at this location
1st junction to R18	Track	None	Follows contours to minimise cut and fill work and avoids habitat restoration area where possible	Most of route on peat <0.5m. Micrositing to north likely to avoid peat pocket.
R18	Turbine	None	Sited with minimum distances to R9 (n), R39(S), R41(w) and to minimise cut and fill. Constrained by slopes to north and west. Crane pad orientated to suit contours.	Within forestry on degraded peat habitat to be restored. Micrositing will avoid deep peat insofar as possible
1st junction to R9	Track	Relocated to south west	Easiest path through contours to reduce cut and fill.	Track adjustment avoids area of peat depths in 0.5m - 1.0m range although likely <0.5m based on coring
R9	Turbine	None	Sited with minimum distance to R6 (w) & R18 (s). Constrained by Site boundary (n), PROW (s), batching plant & R6 west and Curlews & slope (E). Crane pad orientated to suit contours.	Coring has indicated that actual peat depth is <0.5m in turbine base area
R9 to R6	Track	Relocated to north	Easiest path through contours to reduce cut & fill and to avoid cultural heritage.	Peat depths are <0.5m in this section
R6	Turbine	None	Sited at top of slope with minimum distances to R9 (e), R5 (w). Constrained by cultural heritage (n & w), slope & Prow (s). Crane pad orientated to suit contours and constraints	Coring has indicated that actual peat depth is <0.5m in turbine base area
R6 to R5	Track	Track relocated to north	Designed to follow contours, reduce cut and fill and avoid cultural heritage and PROW constraints.	Movement for other constraints still allows avoidance of peat >0.5m

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R5	Turbine	None	Sited with minimum distance to R4 (nw), R6 (E). Constrained by slope (s & w). Crane pad orientated to suit contours.	Peat depths are <0.5m at this turbine base
R5 to R32	Track	None	Follows existing track and contours avoiding habitat restoration areas.	Only small pocket of probes indicating peat possibly >0.5m. Micrositing likely to avoid and actual peat depth expected to be <0.5m
R32	Turbine	None	Sited with minimum distances to R31 (n) and R41(e). Constrained by slope (e & w).Crane pad orientated to suit contours.	Peat depths are <0.5m at this turbine base
R32 to R31	Track	Slight adjustment of track near R31 to north	Follows contours to reduce cut and fill	Track moved away from deeper peat within forestry
R31	Turbine	None	Sited with minimum distances to R32 (s), R4 (ne). Constrained by slope(n, e & w) and PROW (s). Crane pad orientated to suit contours.	Peat depths difficult to establish in forestry. Potential for micrositing to west outside of deeper peat area.
R31 to R29 and R30	Track	Removed		Two pockets of deeper peat have been avoided through the removal of these turbines
R29	Turbine	Removed due to Landscape		No peat at this location
R30	Turbine	Removed due to Landscape		No peat at this location
R5 to R4	Track	Relocation of track to west	Follows contours to reduce cut and fill	Movement away from larger area of deep peat. Small pocket of peat crossed where micrositing may enable avoidance

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R4	Turbine	None	Sited with minimum distances to R31 (sw) and R5 (se). Constrained by Slope (n) and habitat restoration area. Crane pad orientated to suit contours and constraints.	Micrositing of turbine base to north will avoid the potential deep peat
R4 to R7	Track	Relocated to west out of catchment of soligenous fen	Follows contours and avoids cultural heritage areas and peat	Adjustment of track alignment avoids peat >0.5m
R7	Turbine	Relocated slightly to north	Sited on high ground min distance from R8 (e), avoiding peat. Crane pad orientated to suit contours Crane pad orientated to suit contours.	Movement away from soligenous fen and deeper peat areas
R7 to R8	Track	Relocated to north out of catchment of soligenous fen	Follows contours to reduce cut and fill	All of this area of track is on peat <0.5m
R8	Turbine	Relocated slightly to south	Sited min distance from R7(w) on high ground. Constrained by boundaries (n & s). Crane pad orientated to suit contours.	Probing has indicated that there is no peat >0.5m depth at this location
R4 to R3 to R2 to R1	Track	Removed		Removal avoids crossing of section of deep peat
R3 to R28	Track	Removed		No peat in this section of track
R3	Turbine	Removed due to Landscape		No peat at this location
R2	Turbine	Removed due to Landscape		No peat at this location
R1	Turbine	Removed due to Landscape		No peat at this location

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R28	Turbine	Removed due to Landscape		Avoids possible peat >0.5m at this location
R9 to R10 and R11	Track	Removed		Avoids possible peat >0.5m along this section of track
R10	Turbine	Removed for ornithology		Potential area of peat >0.5m at this turbine base avoided
R11	Turbine	Removed for ornithology		Potential area of peat >0.5m at this turbine base avoided
R9 to R41	Track	Relocated slightly to north	Follows existing tracks and contours to reduce cut and fill and avoid cultural heritage constraints	Track adjusted to avoid pocket of deep peat
R41	Turbine	None	Sited on high ground with minimum distances to R18 (e) & R41 (w). Constrained by Cultural heritage (n) and Slope (n & s). Crane pad orientated to suit contours over stream.	No deep peat at this turbine base
R41 to R18	Track	Removed		Avoids possible areas of deep peat >0.5m along this section of track
R41 to R39	Track	Relocated to west near R39	Located to reduce cut & fill, impact on the habitat restoration area and follow site boundary where possible (allowing for working corridor)	If track is located at forestry boundary peat depth is generally <0.5m. Micrositing required
R39	Turbine	None	Sited on high ground. Constrained by habitat restoration area (n), slope (s & w) and site boundary (e). Crane pad orientated to suit contours.	Coring has indicated that peat depth is <0.5m in this location
Entrance 3		Removed to consolidate site entrances		No peat at this location

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
Entrance 3 to R12	Track	Removed		No peat at this location
Entrance 2		None	Existing entrance and track	No peat at this location
Entrance 2 to 1st junction	Track	None	Follows existing track to reduce impact in Curlew area.	No peat at this location
1st Junction to substation	Track	New due to removal of access 3	Follows existing tracks and contours to reduce cut and fill. Avoids stream and peat pockets.	The potential deep peat pocket on this route was cored and was actually clay. No peat >0.5m depth was located.
Substation to R23	Track	Slight movement to west	Follows contours to reduce cut	No peat at this location
R23	Turbine	None	Sited with min distances to Sub (s), R12 (w), R13 (w). Constrained by slope (n&e) and house buffer (e). Crane pad orientated to suit contours.	No peat at this location
Substation to R12	Track	Track moved to north	Follows contours to reduce cut and fill	Some potential peat >0.5m in this area however unconfirmed by coring which nearby at R12 indicates the probing is overestimating the peat depth
R12	Turbine	None	Sited with min distance to Sub (e), R13(n) and R23(e). Constrained by slope (n, s, w) and boundary (s). Crane pad orientated to suit contours.	Coring confirmed that there is no peat >0.5m at this location
R12 to R13	Track	Track moved to east	Follows contours to reduce cut and fill in stream valley	Some potential peat >0.5m in this area however unconfirmed by coring which nearby at R12 indicates the probing is overestimating the peat depth. Some pockets identified and avoided

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R13	Turbine	None	Site with min distance to R12 (s) and R24 (e). Constrained by slope and stream valley (n, w, e), site boundary (s). Crane pad orientated to suit contours.	No peat at this location
1st Juntion to R42	Track	None	Follows contours to reduce cut and fill and impact on Curlew area	Occasional probe indicating peat depths just in excess of >0.5m however unconfirmed by coring
R42	Turbine	None	Sited outside Curlew area with min distances to R15 (w) & R17 (n). Constrained by slope (e), cultural heritage (e), curlew area (s). Crane pad orientated to suit contours.	Single probe indicating possible peat depth of >0.5m which can be avoided by micrositing to east if confirmed by coring
1st juntion to R24	Track	None	Follows contours and existing track to reduce cut and fill and impact on stream catchment	No peat in this section of track
R24	Turbine	None	Sited on high ground with minimum distance to R15 (n) and R14 (nw). Constrained by slope (s). Crane pad orientated to suit contours.	No peat at this location
R24 to R14	Track	None	Follows contours to reduce cut and fill and impact on stream catchment	Occasional probe indicating peat depths just in excess of >0.5m however unconfirmed by coring
R14	Turbine	None	Sited on high ground with minimum distance to R15 (e) and R24 (se). Constrained by slope (n & s), stream (n) and PROW (n). Crane pad orientated to suit contours.	No peat >0.5m at this location
R14 to R15	Track	None	Follows contours to reduce cut and fill and impact on stream.	Section of potential deep peat unconfirmed by coring. Micrositing required.

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R15	Turbine	Turbine moved to south east	Sited on high ground min distance from R24 (s), R14(w) and R42 (e). Constrained by slope (w) and PROW (s). Crane pad orientated to suit contours.	Micrositing of turbine to south east should avoid peat >0.5m depth
R42 to R15	Track	Removed		Removing track section avoids area of deep peat
R42 to R16	Track	Track reconfigured in this area	Follows contours to reduce cut and fill	Track realignment avoids area of deeper peat although some minor areas of potentially deeper peat crossed - unconfirmed by coring. Micrositing required
R16	Turbine	None	Sited on high ground on improved pasture. Crane pad orientated to suit contours.	Coring confirmed that there is no peat >0.5m at this location
R42 to R17	Track	Track moved slightly north near R17	Follows contours along stream valley	Minor areas of potentially deeper peat are crossed (unconfirmed by coring) therefore micrositing required
R17	Turbine	None	Sited with min spacing to R42 (s) and R25 (n). Constrained by house buffer (e), cultural heritage (w) and slope (e). Crane pad orientated to suit contours and avoid stream.	Micrositing of turbine to south should avoid potential peat >0.5m depth
R17 to R25	Track	Track moved slightly south near R25	Follows contours to reduce cut and fill	Track realignment avoids area of deeper peat although some minor areas of potentially deeper peat crossed - unconfirmed by coring. Micrositing required

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R25	Turbine	None	Sited on high ground to avoid slope (e) and min distance from R17 (s). Constrained by slope (s&e). Crane pad orientated to suit contours.	Coring confirmed that there is no peat >0.5m at this location
R25 to R19	Track	None	Follows contours to reduce cut and fill and reduce impact on stream valley and avoid site boundaries. Crane pad orientated to suit contours.	Minor areas of potentially deeper peat are crossed (unconfirmed by coring) therefore micrositing required
R19	Turbine	None	Sited on high ground to avoid cut and fill in restoration area.	Micrositing of turbine to north should avoid potential peat >0.5m depth
R19 to R22 to R21 to R20	Track	Removed		Removing track section avoids area of deep peat
R22	Turbine	Removed for ornithology		Removal of turbine base avoids potential deep peat
R21	Turbine	Removed for ornithology		Removal of turbine base avoids potential deep peat
R20	Turbine	Removed for ornithology		Removal of turbine base avoids potential deep peat
Entrance 1			Existing entrance track	No peat in this area
Entrance 1 to 1st Junction	Track	None	Follows existing track to avoid additional cut and fill.	There is no peat along this section of track
1st junction to BP5	Track	None	Follows existing track to avoid additional cut and fill.	There is no peat along this section of track

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
1st Junction to R35	Track	None	Follows contours and utilises existing track where available to reduce cut and fill.	Only minor locations where peat is possibly >0.5m deep although unconfirmed by coring, except in forestry area where it is all >0.5m. Micrositing required
R35	Turbine	None	Sited high ground, min distance from R36 (e). Constrained grouse refuge (n). Crane pad orientated to reduce cut and fill.	All probes indicated peat >0.5m depth in this degraded afforested bog. Micrositing required.
R35 to R34 to R33	Track	Removed		Removal of this section of track has avoided a few minor locations of potentially deep peat
R34	Turbine	Removed for ornithology		Removal of this turbine has avoided a pocket of potentially deep peat
R33	Turbine	Removed for ornithology		Removal of this turbine has avoided a pocket of deep peat
R35 to R36	Track	None	Follows contours to reduce cut and fill.	Probing has indicated areas of deep peat within this area of degraded afforested bog. Micrositing required
R36	Turbine	None	Sited min distance from R35 (nw) and R38 (nw). Constrained by slope (s). Crane pad orientated to reduce cut and fill and impact on stream (s).	A number of probes indicate peat >0.5m depth in this degraded afforested bog. Micrositing required.
R36 to R38	Track	None	Follows contours to reduce cut and fill.	Probing has indicated areas of deep peat within this area of degraded afforested bog. Micrositing required

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R38	Turbine	None	Sited on high ground, minimum distance from R36 (se) and R37 (n). Constrained slope and stream valley (e). Crane pad orientated to reduce cut.	Coring has established only one location where peat >0.5m depth coincides with the turbine base. Micrositing to east should avoid any deep peat
R38 to R37	Track	None	Follows contours along stream valley to reduce cut and fill.	Track avoids deeper peat areas to north east and south west. Some minor areas of potentially deep peat (unconfirmed by coring) will require micrositing
R37	Turbine	None	Sited on high ground, minimum distance from R38(se). Constrained by slope (e & n) and peat (n). Crane pad orientated to suit contours/track.	No deep peat at this turbine base location
R37 to R26	Track	None	Follows contours to stream crossing point where works can be minimised.	This section of track crosses a lens of deep peat on the north side of the watercourse. Micrositing required
R26	Turbine	None	Sited on slope/high ground at required distance from R38 (s), R37 (sw). Constrained by slope (s), site boundary (n & e) and peat (n). Crane pad orientated to suit contours.	Coring has established only one location where peat >0.5m depth coincides with the turbine base. Micrositing to east should avoid any deep peat
R26 to R40	Track	Adjustment of track to link from R26 to R40 rather than to R27	Follows contours to reduce cut and fill and connects existing track.	Possible areas of deeper peat along this section of track however unconfirmed by coring and nearby coring has demonstrated the overestimates from probing. Confirmation and micrositing required

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
R40	Turbine	None	Site min distance from R27 (w) and R43 (s). Constrained by slope (s, e & w), site boundary (e), stream (e). Crane pad orientated to suit contours.	Coring has established only one location where peat >0.5m depth coincides with the turbine base. Micrositing to north-east should avoid any deep peat
R27	Turbine	None	Sited on high ground min distance from R40 (s) and site boundary (n, w). Constrained by slope (n). Crane pad orientated to reduce cut/fill.	Coring has established only one location where peat >0.5m depth coincides with the turbine base. Micrositing to north-east should avoid any deep peat
R27 to R43	Track	New track section near R27	Follows contours and joins existing track to reduce impact and cut/fill.	Track rerouting now avoids deeper peat areas to south west. Some minor areas of potentially deep peat (unconfirmed by coring) will require micrositing
R43	Turbine	None	Sited on open ground adjacent to existing track. Slope constraint (S & w). Crane pad orientated to reduce cut/fill.	No deep peat at this turbine base location
Other Infrastructure		**Adjustment from initial layout**	**Engineering Reasoning for Siting**	**Peat Depth Reasoning for Siting**
Construction Compounds			The construction compounds in general have been sited on flat ground where possible and close to entrances to allow enabling earlier in the programme.	
Construction Compound 1		None	Sited on flat improved pasture adjacent to existing farm buildings and track.	No peat at this location
Construction Compound 2		None	Sited on relatively flat land that is to be restored habitat post construction.	Possible area of peat slightly >0.5m although unconfirmed by coring
Construction Compound 3		None	Sited on flat, raised, improved pasture adjacent to existing track and site entrance.	No peat at this location

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
Construction Compound 4		None	Sited on relatively flat improved pasture.	Possible area of peat slightly >0.5m although unconfirmed by coring
Construction Compound 5		None	Sited on improved pasture adjacent to existing track	No peat at this location
Borrow Pits			Borrow pits in general have been sited on or near existing agricultural borrow pits to reduce impact.	
Borrow Pit 1		None	Located at steep ground from existing track adjacent to previously worked area.	No peat at this location
Borrow Pit 2		None	Located at steep ground adjacent to previously worked area.	No peat at this location
Borrow Pit 3		None	Located at steep ground adjacent to previously worked area.	No peat >0.5m at this location
Borrow Pit 4		None	Located at steep face adjacent to previously worked pit.	Possible area of peat slightly >0.5m although unconfirmed by coring
Borrow Pit 5		None	Located off existing track at previously worked, steep stone face.	No peat at this location
Borrow Pit 6		None	Located off existing track at previously worked, steep stone face.	No peat at this location
Substation		New location	Sited to reduce visual impact and accommodate DNO connection and recommendations.	No peat >0.5m at this location
Batching plant		New location	Located near to site entrance to allow enabling earlier in programme. Sited on flat improved pasture to reduce cut and fill.	No peat >0.5m at this location

Turbines and Track		Adjustment from initial layout	Engineering Reasoning for Siting	Peat Depth Reasoning for Siting
Met Mast		Relocated to new location	Sited required distance from R4 (w) and R5(s) in improved pasture adjacent to track. Crane pad orientated to suit contours and track.	No peat >0.5m depth at this location
Welfare Building (South)		New location		No peat >0.5m depth at this location
Welfare Building (North)		New location		No peat >0.5m depth at this location

APPENDIX 4.1: RESIDENTIAL VISUAL AMENITY ASSESSMENT

1.1 Introduction

1.1.1 This study provides an assessment of the change in views and visual amenity from local residential properties that are likely to result from the introduction of the proposed Llanbrynmair Wind Farm into the landscape. The assessment represents an update of the previous residential visual amenity survey included within Supplementary Environmental Information (SEI) (2011)[1].

1.1.2 The study also includes an assessment of the potential cumulative change in views and visual amenity from local residential properties that are likely to result from the introduction of the proposed Llanbrynmair Wind Farm alongside the proposed Carnedd Wen Wind Farm.

1.1.3 The assessment is intended to assist the decision maker in coming to a judgement as to the overall change in residential amenity as a result of the introduction of Llanbrynmair Wind Farm. This assessment explicitly does not consider, or provide information on other components of residential amenity, such as noise, dust, shadow flicker etc. and therefore needs to be read alongside other sections of the Environmental Statement (ES) which cover these subjects.

1.1.4 There is no published guidance available on the distance from the proposed development that should be adopted for a detailed study of visual amenity from residential properties. Common practice and experience suggests that consideration of impacts on residential properties within a study area of between 1km and 3km radius from the nearest turbine is appropriate depending on local landscape characteristics. The Reporter at the Achany appeal stated *"Significant impacts on the visual amenity of residential properties at the operational stage would be confined to within 3km of the site."*[2]

1.1.5 The proximity of turbines and orientation of residential properties are some of the factors to be considered in assessing the potential effects on visual amenity. In the Baillie[3] section 36 decision the Reporter confirmed that *"six houses would be within 500 metres from the nearest turbine, almost 30 within one kilometre, and over 60 within two kilometres"* and that *"The residents of those houses which have the windows of main ground floor rooms orientated directly towards the wind farm, would experience a major and significant visual impact."*[4]

1.1.6 In addition to proximity and orientation of properties, the influence of screening is a factor when considering the potential effects on residential visual amenity. For example the Inspector at the Roos appeal stated in relation to the proximity of residential properties *"I accept that it is primarily those within 2km of the site, where the view across the landscape is not interrupted by features such as buildings or vegetation, that residents would experience the most significant visual impact of the new development."*[5]

1.1.7 The assessment usually includes those properties which are likely to experience a high magnitude of change in their visual amenity as a result of introducing the wind farm into the landscape. Properties with a medium or low magnitude of change in their visual amenity are not examined further for potential effects on living conditions.

[1] *Llanbrynmair Wind Farm Supplementary Environmental Information* (2011) RES
[2] Paragraph 51, Achany Estate, Lairg. Appeal Decision PPA/270/438. 22nd July 2008
[3] Paragraph 8.19, Erection of wind farm at Bardnaheigh Farm, Westfield, by Thurso (Baillie). Case reference IEC/3/105/3, 17th August 2009.
[4] DB 6.18 - Baillie - Properties within 3km of turbine envelope
[5] Paragraph 33, Land to the west of Ivy House, Rectory Road, Roos. Appeal Decision APP/E2001/A/09/2113076. 13th May 2010.

1.2 Background

1.2.1 An assessment of residential visual amenity was undertaken and submitted as Supplementary Environmental Information (SEI) (2011) to the original ES (2009)[6]. The assessment considered the potential visual effect of the wind farm, based on the modified 34 turbine layout, where 9 turbines were removed from the original layout (reduced from the 43 orginally proposed in the ES) in response to a number of factors, including visual effects from the settlements of Llanbrynmair, Llan, Dolfach and Carno.

1.2.2 The residential amenity survey identified properties within 3km of the wind farm from which views were likely to be experienced. The survey indicated that, of the 259 properties located within a 3km radius of the nearest proposed turbine, 41 of these would have direct views; 124 would have indirect views; and 78 would have no views of the proposed turbines. Due to access limitations 16 properties were not surveyed within the original assessment.

1.2.3 The previous assessment predicted change in views or visual amenity from each property as a result of the introduction of the proposed wind farm and describes potential visibility using combinations of the following criteria from ground floor and upper floors:

- *No view – there would be no views of the wind farm from the principal frontage of the property;*
- *Direct view – the principal frontage of the property is oriented in the direction of the wind farm and there would be views;*
- *Indirect view – the principal frontage of the property is not oriented in the direction of the wind farm. Views of the wind farm may only be obtained by the viewer turning their head or by moving to another part of the property; and*
- *Filtered view – the wind farm would be seen through vegetation or views would be partly obscured by buildings and landform.*

1.2.4 The previous assessment concluded that 18 properties were considered likely to experience significant effects upon views and residential visual amenity in Environmental Impact Assessment (EIA) terms. Significant effects were considered likely where a property has a direct view which is not filtered by vegetation and less likely where views are indirect or heavily filtered by vegetation.

1.3 Context to the Assessment

1.3.1 Potential adverse effects on residential amenity, also referred to as *'living conditions'*, of people's residential properties have been a consideration in the determination of applications of wind farm developments.

1.3.2 There is no formal or statutory guidance available as to how to assess the visual component of living conditions however there are a number of previous decisions which are helpful to refer to in establishing how other decision makers throughout the UK have handled the matter. This clearly requires an objective approach but is ultimately a matter of judgement, and as was stated by the Reporter in the Baillie[7] decision *"Any assessment of acceptability in these circumstances relies on judgement rather than measurement."* This judgement should not take account of the range of potential personal attitudes towards wind farms.

1.3.3 This matter of judgement of potential effects on living conditions has been considered at several public inquiries to determine whether the potential effects upon the visual amenity of residential properties is so unsatisfactory that the development in question should be refused planning permission in the public interest.

[6] *Llanbrynmair Wind Farm Environmental Statement* (2009) RES
[7] Paragraph 8.21, Erection of wind farm at Bardnaheigh Farm, Westfield, by Thurso (Baillie). Case reference IEC/3/105/3, 17th August 2009.

1.3.4 In the Baillie[8] decision the Reporter, David Russell, concluded: *"Given that I have found that this wind farm, because of its visual prominence and proximity, would have a significant detrimental impact on the visual amenity of some of the people living nearby, and as the impact would be long term, that interpretation would appear to preclude the granting of consent for this application. However, the guidance also confirms that proposals are to be considered on a case by case basis, and I consider that this inevitably requires a judgement to be reached on the acceptability of the impacts identified."* And, *"In reaching that judgement here, I find that the issue to be addressed is whether the adverse impacts which would be experienced by some of the residents of the 60 or so houses which are within two kilometres of the nearest turbines is sufficient to outweigh the wider public benefits which the development is designed to achieve. In my judgement, on the merits of this case, I find that these adverse impacts are not so great as to be unacceptable, due to: the relatively small number of houses involved; the support expressed by some of these residents, whether through financial involvement or otherwise; the separation distances from the turbines; the compact layout of the wind farm and its position within an open landscape; and the capacity of the landscape to accommodate the wind farm."*

1.3.5 In the decision for the St John's Hill wind farm[9] where 106 properties are located within 1km of the nearest turbine, the Reporter, Malcolm Mahony, concluded: - *"Because views from within the site and from outside it tend to be of a panoramic nature, the windfarm, even though it spreads over a length of some 3km, would occupy only a restricted part of those views and not dominate them."* With regard to visual impacts from residential properties he stated:- *"I have looked carefully at the visual impact of the scheme from individual properties in the vicinity and I am not persuaded that it is unacceptable due to the factors which I have already outlined."*[10]

1.3.6 In the Achany decision the Reporter, Janet McNair, stated that although a significant impact on the visual amenity of residential properties may be experienced *"Deciding whether these impacts are significantly detrimental is a matter of judgement"*[11] and she went on to state that although the properties in question were located within 3km of the proposed development *"the turbines would be far enough away from houses not to be overbearing or dominant"* concluding that *"the appeal proposal would have a significant impact on some views from some properties. However, significant impacts are not necessarily unacceptable and I conclude that its impacts on residential amenity overall would not be significantly detrimental."*

1.3.7 Following the Langham appeal the Inspector stated that *"The planning system controls development in the public interest, and not in the private interest. The preservation of open views is a private interest, which the planning regime is not intended to protect. But public and private interests may overlap. The issue is whether the number, size, layout and proximity of wind turbines would have such an overwhelming and oppressive visual impact on a dwelling and its amenity space that they would result in unsatisfactory Living Conditions, and so unacceptably affect amenities and the use of land and buildings which ought to be protected in the public interest."* [12]

1.3.8 At Enifer Downs, Inspector Lavender noted that *"when turbines are present in such number, size and proximity that they represent an unpleasantly overwhelming and unavoidable presence in main views from a house or garden, there is every likelihood that the property concerned would come to be widely regarded as an unattractive and thus unsatisfactory (but not necessarily uninhabitable) place in which to live."*[13]

[8] Paragraph 8.25 and 8.26, Erection of wind farm at Bardnaheigh Farm, Westfield, by Thurso (Baillie). Case reference IEC/3/105/3, 17th August 2009.
[9] DB 6.19 – St John's Hill - Properties within 3km of turbine envelope
[10] Paragraph 117 & 120, Erection of 9 wind turbines and associated infrastructure at St Johns Hill, Stonehaven. Ref: P/PPA/110/634 26th November 2007
[11] Paragraph 138 and 144, Achany Estate, Lairg. Appeal Decision PPA/270/438. 22nd July 2008
[12] Paragraph 63 Land between Anderby, Anderby Creek, Chapel St Leonard's and Langham. Appeal Decision APP/D2510/A/10/2130539. 29th September 2011.
[13] Paragraph 66 Land west of Enifer Downs Farm and east of Archers Court Road and Little Pineham Farm, Langdon, Appeal decision APP/X2220/A/08/2071880. 28thApril 2009

1.3.9 The Inspector considered the extent to which:

- the visual experience from the dwelling and garden may be comparable to *"actually living within the turbine cluster"* rather than a turbine cluster being present close by; or
- the experience of the turbines is *"unpleasantly overwhelming and unavoidable."*

1.3.10 In the Carland Cross Appeal Decision of 19th January 2011 (Inspector Lavender), there were 209 properties within 3km of the proposed turbines (Para 23). 23 were identified as likely to experience "high significance of visual impact" which in each case the Council judged to be as "overwhelmingly adverse." But the Inspector stated:

"However, those who face the prospect of living close to a wind farm may attach very different value judgements to their visual impact than the wider public, who stand to benefit from the energy produced without seeing the turbines from their homes. In impact, the former is primarily a private interest whereas he latter is a public one and, in the case of the former, few householders are able to exercise control over development by others that may do no more than impinge into the outlook from their property. The planning system is designed to protect the public rather than private interests, but both interests may coincide where, for example, visual intrusion is of such magnitude as to render a property an unattractive place in which to live. This is because it is not in the public interest to create such living conditions where they did not exist before. Thus I do not consider that simply being able to see a turbine or turbines from a particular window or part of the garden of a house is sufficient reason to find the visual impact unacceptable (even though a particular occupier might find it objectionable)."

1.3.11 Importantly, a Secretary of State case which has further confirmed this approach is the Burnthouse Farm decision of 6th July 2011. In the Inspector's conclusions on this decision he addressed living conditions of neighboring occupiers and stated at paragraph 229 that:-

"The methodology for assessing the visual impact on residential occupiers was considered fully at the Inquiry. I accept that the approach used by Inspectors in the Enifer Downs, Poplar Lane and Carland Cross Appeals and elsewhere [62 – 63, 119 -120] should not be regarded as a mechanistic 'test' and has no status in terms of being part of statutory documentation or planning policy or guidance. However, it seems to me that a logical, transparent and objective approach to assessing visual impact should be adopted."

1.3.12 The Inspector went on to state that there can be no substitute for site visits to individual properties so that any likely impacts can be judged in the particular and unique circumstances of each case. He added at paragraph 230 that:-

"Nevertheless, it is helpful to consider the factors and thresholds of acceptability which have guided decision makers in other cases [51, 122]."

1.3.13 At paragraph 232 the Inspector stated that serious harm to living conditions which might lead to a recommendation for planning permission to be refused, in the public interest is a more stringent requirement than the identification of a significant adverse impact. He added that:-

"I consider that when assessing the effect on visual outlook, it is helpful to pose the question 'would the proposal affect the outlook of these residents to such an extent i.e. be so unpleasant, overwhelming and oppressive that this would become an unattractive place to live?"[14]

1.3.14 In considering these and other appeal decisions, the visual effect of the wind farm has to be commonly described as 'unacceptably overbearing', 'over powering', 'oppressive' or 'unpleasantly overwhelming and unavoidably present in main views' for there to be a potential unacceptable adverse impact on living conditions and such impacts should also *'…outweigh the wider public benefits which the development is designed to achieve.'*

1.3.15 Within a number of these appeal decisions, Reporters (in Scotland) and Inspectors (in England and Wales) have sought to develop criteria against which to assess changes to visual amenity at properties and these include:

[14] Paragraph 232 Land North of Burnthoue Farm, Appeal Decision APP/D0515/A/2123739. 6th July 2011

- Proximity - how far the turbines are from the property in question is always a key factor;
- Screening - where turbines are screened by vegetation or other buildings the visual effect is lessened;
- Orientation - direct views are considered more likely to cause harm than oblique ones (orientation can include the orientation of the windows of the house, the location and orientation of external amenity areas and the orientation of the approach to the house); and
- Spread of Turbines - where the turbines occupy a large proportion of the view, this increases the visual effect.

1.3.16 It is thought that if the wind farm is unavoidably present in main views, that this in itself does not demonstrate material harm to living conditions. However, a judgement requires to be made "in the round" considering all available views and other factors. These factors as outlined in the above criteria and in combination with the consideration of layout of the dwelling, the focus and context of the existing view, and if there are other directions residents can look in which are not affected; the degree to which overall available views would be affected; the extent of turbines which would be seen (i.e. upper parts of turbines or their whole, visibility of associated structures such as tracks and the substation), availability of screening and other factors.

1.3.17 Consideration of these factors allow a judgement to be made within the assessment of each property as to whether the presence of turbines or other visual components of the development would be visually dominant, overbearing or oppressive and whether the wind turbines or other visual components of the development would affect *"the outlook of these residents to such an extent i.e. be so unpleasant, overwhelming and oppressive that this would become an unattractive place to live?"*

Summary

1.3.18 Informed by the approach taken by several Reporters and Inspectors to the assessment of effects of changes in views and visual amenity (of residential properties) on living conditions the assessment process of this study can be summarised in three steps:

- identification of properties to be considered;
- an assessment of the change in views and visual amenity likely to be experienced at the property (magnitude of change to views and visual amenity and magnitude of cumulative change to views and visual amenity) and;
- coming to a judgement as to whether the properties where the assessment predicts high magnitude of change in visual amenity have the potential to adversely affect the visual component of living conditions when considered 'in the round'.

1.4 Methodology

1.4.1 The following section sets out the methodology and the factors considered in describing the existing views from a property, and the potential changes in views as a result of the presence of the proposed wind farm in the landscape.

1.4.2 In accordance with the Guidelines for Landscape and Visual Impact Assessment (GLVIA3)[15], and relating to wind farm developments, when assessing the effects on visual amenity of residential properties, a combination of the following factors may be considered:

- *"The scale of change in the view with respect to the loss or addition of features in the view and changes in its composition including the proportion of the view occupied by the proposed development;*

[15] *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)* (2013) Landscape Institute and the Institute of Environmental Management & Assessment

- *the degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture;*
- *the angle of view in relation to the main activity of the receptor;*
- *the distance of the viewpoint from the proposed development;*
- *the extent of the area over which the changes would be visible*;"[16]
- the (relative) size and proximity of turbines;
- the type and nature of the available view (e.g. panoramic, framed);
- the direction (including the aspect) of the view affected;
- the density and spacing of turbines and their overall composition in the view;
- the cumulative change to the view when viewed alongside the proposed turbines of Carnedd Wen Wind Farm[17]; and
- the extent and nature of visibility of ancillary infrastructure (tracks, borrow pits, substation etc.).

1.4.3 In order to understand the existing visual amenity and how views of turbines would change this, it is necessary to ascertain what contributes to visual amenity as experienced by people in and around their private dwellings. Additionally, the components of the proposed development which could potentially change views need to be understood.

Baseline Visual Amenity

1.4.4 For the purposes of this study, the visual amenity experienced at a property comprises a combination the type, nature, extent and quality of views that may be experienced from the property and its domestic curtilage (gardens and access drives). Most of the assessment work can normally be based on observations made from publically accessible locations and no internal inspection of the properties is required for the assessment. However, properties which are expected to experience a high magnitude of change, properties which are not readily observed from publically accessible locations and properties with residents who have raised objections to the scheme were visited, with the property owner's permission.

1.4.5 In considering baseline visual amenity, the following has been examined:

- the nature and extent of the potentially available existing (including main/primary) views from the property, and its garden, including the proximity and relationship of the property to surrounding landform, landcover and visual foci; and
- views as experienced when approaching or departing from the property via its driveway and/or access track, if applicable.

Examination of potential changes to views

1.4.6 The study comprised the following main activities:

- collation and preparation of baseline information from maps and aerial photography for field survey;
- initial field surveys;
- identification of a preliminary list of properties to be considered for detailed assessment;

[16] Page 115, *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)* (2013) Landscape Institute and the Institute of Environmental Management & Assessment

[17] No other existing or proposed wind farms are likely to give rise to significant changes in views and visual amenity from properties included in this assessment; therefore no other cumulative schemes are included within this assessment.

- identification of properties to include in the detailed assessment based on observation of the Zone of Theoretical Visibility (ZTV) and field survey;
- identification of properties included in the detailed assessment which may experience a cumulative change in views and visual amenity based on observation of the Cumulative Zone of Theoretical Visibility (CZTV) and field survey;
- preparation of wireframe visualisations for use in detailed field survey;
- field survey to assess potential visual change from each residential property included in detailed assessment;
- description and evaluation of the nature of the proposed change to views;
- reporting of conclusions in relation to the magnitude of change and the magnitude of cumulative change to views and visual amenity alongside the proposed Carnedd Wen Wind Farm; and
- for those properties with a high magnitude of change to views and visual amenity, a conclusion in relation to the visual component of residential amenity in relation to living conditions.

Collation of Baseline Information

1.4.7 Ordnance Survey Maps and aerial images[18] were used for desktop research to assist with recording information such as the access or approach to the property, the orientation of the property, the extent of its curtilage and the presence of vegetation (trees and hedgerows) and buildings surrounding the property.

Preparation of Zone of Theoretical Visibility (ZTV)

1.4.8 A turbine blade tip height Zone of Theoretical Visibility (ZTV) was generated based on the proposed 30 turbine layout, upon which the location of each of the residential properties was plotted. Theoretical visibility from each residential property is indicated by the ZTV shown on **Appendix 4.1, Figure 1a-e** and listed in **Appendix Table 4.1**.

Preparation of Cumulative Zone of Theoretical Visibility (CZTV)

1.4.9 A turbine blade tip height Cumulative Zone of Theoretical Visibility (CZTV) was generated based on the proposed 30 turbine layout of the Proposed Development and the 50 turbine layout of the proposed Carnedd Wen Wind Wind Farm development, upon which the location of each of the residential properties was plotted. Theoretical cumulative visibility from each residential property is indicated by the CZTV shown on **Appendix 4.1, Figure 1f-j** and listed in **Appendix Table 4.1**, indicating.

Identification of Residential Properties

1.4.10 All properties within 2.5km radius of the outermost turbines were included for consideration in the assessment, along with a small number of properties located outside 2.5km[19] of the outermost turbines, which were added to the assessment following initial field visits.

1.4.11 A total of 119 properties (identified using OS Mastermap Address Layer 2 data, Address Base Plus and further verified in the field) were considered within this study. Each of these properties is listed in Appendix Table 4.1 and mapped on Appendix 4.1, Figure 1a-e.

1.4.12 Initial field surveys were conducted in December 2012[20] to verify the list of properties to be included in the detailed assessment. Theoretical Visibility of turbines, indicated by the tip

[18] Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, User Community IGP, and the GIS

[19] It is noted that no significant visual effects were identified from residential properties located outside 2.5km of the outermost turbines within the previous residential amenity survey.

height ZTV and wireframe visualisations, was verified in the field in order to establish the final list of residential properties to be included in the detailed assessment.

1.4.13 Properties from which no visibility of the Proposed Development is predicted were 'scoped out' and not considered within the detailed assessment as indicated in **Appendix Table 4.1**. A number of additional properties from which limited visibility of turbines was predicted were also 'scoped out' and not considered within the detailed assessment following verification in the field that the presence of screening, from localised landscape features, built form or dense vegetation would result in no potential visibility of turbines.

1.4.14 A total number of 63 residential properties were identified for inclusion in the detailed assessment, through the use of the ZTV, maps, aerial photography and field surveys, the details of which are summarised in **Appendix Table 4.2**. Each property was examined in terms of its existing views and visual amenity and the change in views and visual amenity that would result from the introduction of the Proposed Development. The magnitude of change which would be experienced was judged, and the change in views summarised, taking on board the key considerations listed in **Paragraph 4.4.2**.

1.4.15 The judgement consists of:

- a description of the property and of its location and context;
- a description of the likely existing available views and visual amenity from the property; and
- a description of the likely effect on views and visual amenity resulting from the Proposed Development, as well as those experienced as a result of the introduction of Carnedd Wen Wind Farm, to the property and its domestic curtilage, including gardens and private or shared access drives.

1.4.16 36 residential properties were identified through the use of the CZTV as having potential for visibility of the proposed turbines of Carnedd Wen Wind Farm and the Proposed Development, resulting in potential cumulative changes in views and visual amenity, the details of which are summarised in **Appendix Table 4.2**.

1.4.17 Each of these 36 properties was examined in terms of its existing views and visual amenity and the cumulative change in views and visual amenity that would result from the introduction of the Proposed Development alongside a baseline situation which includes the proposed turbines of Carnedd Wen Wind Farm. The magnitude of cumulative change which would be experienced was judged, and the change in views summarised, taking on board the considerations listed in **Paragraph 4.4.2**.

1.4.18 The assessment of those properties where a high magnitude of change to views and visual amenity is predicted concludes with a judgement with respect to the visual component of 'living conditions'. This judgement should in turn be considered by the Reporter and by planners as part of the wider planning judgement with respect to 'residential amenity'.

Visualisations

1.4.19 Aerial images were used for desktop research to assist with the preparation of material for fieldwork.

1.4.20 Wireframe visualisations were prepared for each of the properties, using 12 digit OS coordinates, selected from OS Master Map Address Layer data, and were verified during fieldwork.

1.4.21 Wireframe visualisations (**Appendix 4.1, Figures 2 – 64**) at both 90^0 and 50^0 were generated using *Resoft Windfarm - Release 4* software, using a 2m viewing height and illustrate a bare ground situation, which does not take into account any buildings, tree cover or vegetation and which may provide screening or filtering of views - the wireframe visualisations therefore represent a maximum visibility scenario. The wireframe visualisations also include the proposed permanent meteorological mast and the turbines of the proposed Carnedd Wen

[20] Field Surveys undertaken: 13th – 14th December 2012.

Wind Farm, in order to understand the potential cumulative visual change to views and visual amenity from each residential property where visibility of the Proposed Development and Carnedd Wen is possible.

1.4.22 It should be noted that OS grid references given are based on the location of the main building of each property listed, and are used as the illustrative assessment point. This assessment point is representative of a range of points from which views are experienced at the property. As such wireframes are representative of a range of views, and the stated distances and angles measured from this point are subject to some variation, depending on the exact viewing location. In addition, it is recognised that views may be more extensive from upper storey windows than is represented by wireframes generated at 2m above ground level.

Field Surveys

1.4.23 Further field surveys from publicly accessible locations in the vicinity of properties and the private curtilages of some selected properties[21] were undertaken in February 2013[22] to collect the following baseline data and carry out the assessment of visual effects:

- the orientation and likely views from each property (including main aspects and direction of windows);
- layout and orientation of the external spaces and gardens associated with the property curtilage;
- access location, and likely views from private or shared driveways or access tracks as appropriate; and
- the composition, type and experience of existing views from each property and its curtilage.

1.4.24 The detailed field surveys considered local variations in topography, tree cover and potential screening by buildings within the landscape.

1.4.25 The closest publicly accessible points to the properties were used for the assessment. No verification of the interior layout and use of rooms within properties was undertaken and the assessors did not access private land, except where selected properties were visited with the property owner's permission.

1.4.26 The field surveys were carried out in winter months to ensure views experienced from properties were assessed while potential screening from vegetation and foliage was not present, therefore representing the 'maximum effect' or 'worst case' scenario of potential visibility.

Potential Changes to Views

1.4.27 Informed by the preparatory desk work and supported by maps and wireframes, an assessment was undertaken during field surveys of the likely change in view that may result from the introduction of the wind farm into the local landscape and the view(s) from the property.

1.4.28 Potential changes to views are examined with reference to the sensitivity of the viewer (or viewing location), and the likely magnitude of change. For the purpose of this assessment, and taking a precautionary approach, all residential receptors were considered to be of high sensitivity to change in their visual amenity.

1.4.29 Magnitude of change is expressed on a relative scale in relation to the properties examined as part of this study. By using a relative scale of magnitude of change, the differences between the types of change experienced in views are highlighted. The existing and

[21] Prior permission was sought from residents of properties before access field surveys were undertaken from private property.
[22] Field Surveys undertaken: 20th – 22nd February 2013.

proposed view from each property is described, and the likely relative magnitude of change (high, medium, low, barely perceptible and none) arising from the Proposed Development determined. The nature of existing and predicted views (open, enclosed, panoramic, focused, framed etc.) affects the relative magnitude of change and is taken on board in reaching that judgement. Receptors at properties with a higher magnitude of change are likely to have more visibility of the Proposed Development, than those with a lower magnitude of change.

Potential Cumulative Changes to Views

1.4.30 The magnitude of cumulative change to views and visual amenity is also expressed on the same scale. Receptors at properties with a higher magnitude of cumulative change are likely to have more visibility of turbines of the Proposed Development than the turbines of Carnedd Wen Wind Farm. However, where the turbines of Carnedd Wen are in close proximity to the property and visibility is extensive, the magntitude of cumulative change would likely be lower.

1.5 Judgement of Effects on Visual Component of Living Conditions

1.5.1 Each property where a high magnitude of change to views and visual amenity was identified concludes with a judgement with respect to the visual component of 'living conditions'. This judgement should in turn be considered by the Inspector and by planners as part of the wider planning judgement with respect to 'residential amenity'.

Appendix Table 4.1: Residential Properties Considered for Assessment

ID	Property Name	OS Grid Reference		Distance from nearest turbine (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Theoretical Visibility of Carnedd Wen predicted by CZTV	Comments following Fieldwork (reasons for inclusion / exclusion)	Property included in detailed assessment
		X	Y							
Properties obtained from *Address Layer 2 data* & *Address Base Plus data*										
P1	Pen Yr Eisteddfod	297941	310870	2252m	R40	Yes	1 Hub/3 Tips	Yes	Potential views of Proposed Development in combination with Carnedd Wen	✓
P2	Caecrwn	298046	310849	2290m	R40	Yes	1 Hub/3 Tips	Yes	Potential views of Proposed Development in combination with Carnedd Wen	✓
P3	Lluestfach	298125	310962	2427m	R40	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P4	Llety Bach	298827	310247	2424m	R40	Yes	16 Hubs/20 Tips	Yes	Potential long distance views from the edge of the study area towards northern turbines of the Proposed Development	✓
P5	Llety Mawr	298836	310271	2445m	R40	Yes	16 Hubs/18 Tips	Yes	Potential long distance views from the edge of the study area towards northern turbines of the Proposed Development	✓
P6	Ffridd Newydd	298529	309887	1984m	R40	Yes	24 Hubs/29 Tips	Yes	Potential long distance views from the edge of the study area towards northern turbines of the Proposed Development	✓
P7	Bryn Du	298655	309689	2013m	R40	Yes	11 Hubs/16 Tips	Yes	Potential long distance views from the edge of the study area towards northern turbines of the Proposed Development	✓
P8	Ysgubor Cannon	295943	307427	864m	R17	Yes	10 Hubs/15 Tips	Yes	Property located within the Development Site boundary with potential visibility of turbines	✓
P9	Cannon	295885	307418	811m	R17	Yes	10 Hubs/17 Tips	Yes	Property located within the Development Site boundary with potential visibility of turbines	✓
P10	Dolwen Uchaf	297495	307619	1087m	R43	Yes	12 Hubs/25 Tips	Yes	Property located within the Development Site boundary with potential visibility of turbines	✓
P11	Dolwen Isaf	297531	307558	1157m	R43	Yes	25 Hubs/28 Tips	Yes	Property located within the Development Site boundary with potential visibility of turbines	✓
P12	Moelddolwen	299212	307781	2491m	R43	Yes	2 Hubs/4 Tips	None	Potential long distance views from the edge of the study area towards northern turbines of the Proposed Development	✓
P13	Abercannon	296276	306932	1011m	R42	Yes	17 Hubs/19 Tips	Yes	Property located within the Development Site boundary with potential visibility of turbines	✓
P14	Hafod Y Beudy	298907	307166	2462m	R43	Yes	6 Hubs/6 Tips	Yes	Potential long distance views from the edge of the study area towards northern turbines of the Proposed Development	✓
P15	Neint Hirion	296389	306603	1050m	R42	Yes	16 Hubs/19 Tips	Yes	Property located within broad valley of Nant yr Eira with potential visibility of large extent of Proposed Development	✓
P16	Beulah Chapel House	296392	306656	1057m	R42	Yes	17 Hubs/19 Tips	Yes	Property located within broad valley of Nant yr Eira with potential visibility of large extent of Proposed Development	✓
P17	Dolau	297043	306755	1715m	R42	Yes	23 Hubs/27 Tips	Yes	Property located within broad valley of Nant yr Eira with potential visibility of large extent of Proposed Development	✓
P18	Dolau Ceimion	296395	305841	1272m	R42	Yes	26 Hubs/29 Tips	Yes	Property located within broad valley of Nant yr Eira with potential visibility of large extent of Proposed Development	✓
P19	Cwm Derwen	295551	305393	887m	R23	Yes	11 Hubs/22 Tips	Yes	Property located within the Development Site boundary with potential visibility of turbines	✓
P20	Delfryn	295711	305449	986m	R24	Yes	13 Hubs/25 Tips	Yes	Property located within broad valley of Nant yr Eira with potential visibility of large extent of Proposed Development	✓
P21	Ffriddfawr	294686	303975	926m	R9	Yes	21 Hubs/30 Tips	Yes	Property located within broad valley of Nant yr Eira with potential visibility of large extent of Proposed Development	✓
P22	Castell Y Gwynt	294882	302964	1360m	R39	Yes	30 Hubs/30 Tips	Yes	Property located in elevated position overlooking the broad valley of Nant yr Eira and open views of Proposed Development	✓

ID	Property Name	OS Grid Reference		Distance from nearest turbine (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Theoretical Visibility of Carnedd Wen predicted by CZTV	Comments following Fieldwork (reasons for inclusion / exclusion)	Property included in detailed assessment
		X	Y							
P23	Pant Y Powsi	294814	302372	1517m	R39	Yes	0 Hubs/6 Tips	None	Property located east of the Development Site in the shallow valley of Afon Tyn-y-rhos with potential visibility of the Proposed Development	✓
P24	Nant Yr Esgairwen	294384	302251	1267m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P25	Capel Yr Aber	293960	301839	1422m	R39	Yes	0 Hubs/0 Tips	None	Property outside ZTV, however visibility of Proposed Development may be possible when approaching property via private driveway	✓
P26	Cwm Bach	293868	301056	2167m	R39	Yes	9 Hubs/13 Tips	Yes	Property located in an elevated position above the shallow valley of Afon Tyn-y-rhos with potential visibility of the Proposed Development	✓
P27	Llwyn Celyn	293548	300750	2448m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P28	Pant Glas	293171	300944	2284m	R39	Yes	4 Hubs/10 Tips	Yes	Property located alongside minor road from Talerddigg with potential visibility of the southern extent of the Proposed Development	✓
P29	Tyn Y Ddol	292735	301056	2289m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P30	Hafod Y Foel	292950	301606	1699m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P31	Foel Fach	292737	301877	1547m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P32	Cefn	292551	302071	1501m	R39	Yes	17 Hubs/22 Tips	None	Property located in elevated position above Moel Caetwpa close to the southern extent of the Proposed Development	✓
P33	Plas Newydd	292506	301028	2405m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P34	2 Glandwr	292412	301133	2354m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P35	1 Glandwr	292406	301137	2353m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P36	Glandwr House	292406	301137	2353m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P37	Llaw Coed Uchaf	292399	301184	2316m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P38	1 Llawrcoed Isaf	292302	301190	2360m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P39	2 Llawrcoed Isaf	292298	301188	2364m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P40	Coed Glyn Laen	292318	301411	2166m	R39	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P41	Tyn Yr Wtre	291804	301534	2208m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P42	Cae Twpa Cottage	291621	301648	2170m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P43	Cae Twpa Farm	291583	301657	2178m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P44	Tremafon	291428	301621	2281m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	

ID	Property Name	OS Grid Reference		Distance from nearest turbine (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Theoretical Visibility of Carnedd Wen predicted by CZTV	Comments following Fieldwork (reasons for inclusion / exclusion)	Property included in detailed assessment
		X	Y							
P45	Faenol	291401	301626	2290m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P46	2 Dolalaw	291375	301674	2261m	R32	Yes	0 Hubs/2 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P47	3 Dolfach	291375	301674	2261m	R32	Yes	0 Hubs/2 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P48	1 Dolalaw	291368	301678	2261m	R32	Yes	0 Hubs/3 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P49	Dolern	291357	301682	2263m	R32	Yes	1 Hub/3 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P50	Brynmair	291340	301692	2264m	R32	Yes	1 Hub/4 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P51	Maesteg	291336	301695	2263m	R32	Yes	1 Hub/4 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P52	Isfryn	291332	301697	2264m	R32	Yes	1 Hub/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P53	2 Brynderwen	291276	301719	2275m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P54	1 Brynderwen	291268	301721	2278m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P55	Ceinfan	291279	301757	2242m	R32	Yes	2 Hubs/5 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P56	Cartrefle	291250	301748	2265m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P57	Bronhaul	291237	301751	2270m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P58	Gwynfa	291228	301753	2274m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P59	Tegfan	291237	301758	2265m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P60	Pen Y Craig	291072	301765	2357m	R32	Yes	2 Hubs/6 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P61	Braichodnant	291034	301675	2451m	R32	Yes	3 Hubs/8 Tips	Yes	Potential visibility of Proposed Development in views north, north-east across the Afon Laen river valley	✓
P62	Llwynderw	291268	301803	2210m	R32	Yes	2 Hubs/5 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P63	Llannerch Wen	291239	301836	2200m	R32	Yes	2 Hubs/5 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P64	Chapel Crossing	291303	301887	2121m	R32	Yes	1 Hub/5 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P65	Coed Llwynog	291263	301889	2143m	R32	Yes	1 Hub/5 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓
P66	Gwenlli	291255	301893	2144m	R32	Yes	1 Hub/5 Tips	None	Potential visibility of Proposed Development in pitched views north, north-east from the Afon Laen river valley	✓

ID	Property Name	OS Grid Reference		Distance from nearest turbine (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Theoretical Visibility of Carnedd Wen predicted by CZTV	Comments following Fieldwork (reasons for inclusion / exclusion)	Property included in detailed assessment
		X	Y							
P67	Capel Soar	291344	301960	2038m	R32	Yes	2 Hubs/5 Tips	None	Potential visibility of Proposed Development in views north, north-east from the Afon Laen river valley	✓
P68	Cwm Carnedd Isaf	291814	302644	1208m	R32	Yes	0 Hubs/2 Tips	None	Pitched views possible from the curtilage of the property of turbines located at southern extent of the Proposed Development	✓
P69	Cwm Carnedd Uchaf	291580	302870	1206m	R32	Yes	0 Hubs/2 Tips	None	Pitched views possible from the curtilage of the property of turbines located at southern extent of the Proposed Development	✓
P70	Swn Yr Iaen	290945	302071	2213m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P71	Dol Lydan	290896	302151	2193m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P72	Garth	290814	302230	2204m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P73	Broniaen	290812	302259	2188m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P74	1 Penddol	290773	302305	2190m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P75	3 Penddol	290769	302309	2191m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P76	4 Penddol	290775	302321	2179m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P77	Dol Yr Onen	290660	302339	2262m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P78	1 Winllan	290655	302373	2247m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P79	2 Winllan	290661	302374	2242m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P80	3 Winllan	290667	302376	2235m	R32	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P81	Coedcae	290429	302653	2307m	R32	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P82	Brynllys	290283	302721	2397m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P83	Lon Hyfryd	290286	302748	2380m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P84	Cefn Llys	290181	302722	2484m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P85	Berthlas	290635	303128	1891m	R31	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P86	Wynnstay Farm	290185	303009	2348m	R31	Yes	0 Hubs/1 Tip	Yes	Theoretical visibility indicated by the ZTV, with potential for pitched views of the Proposed Development above Cerrig y Tân	✓
P87	Soar	290003	303052	2499m	R31	Yes	0 Hubs/1 Tip	Yes	Theoretical visibility indicated by the ZTV, with potential for pitched views of the Proposed Development above Cerrig y Tân	✓
P88	Pendientir	290010	303076	2484m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	

ID	Property Name	OS Grid Reference		Distance from nearest turbine (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Theoretical Visibility of Carnedd Wen predicted by CZTV	Comments following Fieldwork (reasons for inclusion / exclusion)	Property included in detailed assessment
		X	Y							
P89	Berthlwyd	291032	303783	1307m	R31	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P90	Gilwern	290475	303823	1856m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P91	Clegyrddwr	290254	303760	2082m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P92	2 Glanllyn	290476	304019	1849m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P93	1 Glanllyn	290476	304013	1849m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P94	Brynaere Uchaf	289858	304093	2470m	R31	Yes	0 Hubs/5 Tips	Yes	Property located in elevated position with potential views of the Proposed Development across the adjacent valley to the east	✓
P95	Pandy Chapel	290468	304393	1903m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P96	Old Post Office	290508	304408	1868m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P97	Pandy Cottage	290499	304425	1880m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P98	The Smithy	290477	304430	1903m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P99	Un Cariad	290519	304460	1870m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P100	Pwll Melyn	291023	304698	1489m	R31	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P101	Pandy Rhos	290465	304760	2018m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P102	Ty Newydd	290435	304736	2037m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P103	Bodhyfryd	290360	304663	2082m	R31	Yes	0 Hubs/1 Tip	Yes	Theoretical visibility indicated by the ZTV, with potential views of the Proposed Development available to the east of the property	✓
P104	Llwyngwern	290355	304660	2085m	R31	Yes	0 Hubs/1 Tip	Yes	Theoretical visibility indicated by the ZTV, with potential views of the Proposed Development available to the east of the property	✓
P105	Rhiwsaesin Mill	290312	304656	2125m	R31	Yes	0 Hubs/1 Tip	Yes	Theoretical visibility indicated by the ZTV, with potential views of the Proposed Development available to the east of the property	✓
P106	Pencaedu	290303	304897	2222m	R31	Yes	0 Hubs/1 Tip	Yes	Theoretical visibility indicated by the ZTV, with potential views of the Proposed Development available to the east of the property	✓
P107	Cwm Y Ffynnon[23]	291206	305317	1729m	R4	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P108	Barlings Barn	290997	305185	1796m	R31	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P109	Plas Rhiw Saeson	290184	305190	2461m	R31	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	

[23] Property is financially involved in the Proposed Development

ID	Property Name	OS Grid Reference		Distance from nearest turbine (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Theoretical Visibility of Carnedd Wen predicted by CZTV	Comments following Fieldwork (reasons for inclusion / exclusion)	Property included in detailed assessment
		X	Y							
P110	Factory Cottage	290222	305325	2498m	R31	None	0 Hubs/0 Tips	None	Potential visibility verified in field and excluded from further detailed assessment	
P111	Cwmpen Llydan[24]	292894	306371	1425m	R8	None	0 Hubs/0 Tips	Yes	Potential visibility verified in field and excluded from further detailed assessment	
P112	Rhydymeirch	292084	306868	2122m	R7	Yes	0 Hubs/1 Tip	Yes	Farmhouse property located in foot of valley with potential for pitched views towards Proposed Development	✓
P113	Clegyrnant	292154	307624	2334m	R19	Yes	0 Hubs/2 Tips	Yes	House in elevated position on western slopes of valley with potential views of the Proposed Development	✓
Additional Properties identified in the field[25]										
AP1	The Lodge	290186	305441	2594m	R31	Yes	0 Hubs/1 Tip	Yes	Property lies on just beyond 2.5km boundary, but may experience potential views of Proposed Development	✓
AP2	*Opposite P109	290113	305132	2496m	R31	Yes	0 Hubs/1 Tip	Yes	Property lies on just beyond 2.5km boundary, but may experience potential views of Proposed Development	✓
AP3	6 Properties opposite Faenol & Tremafon[26]	291435	301670	2235m	R32	None	0 Hubs/0 Tips	None	New build properties (1 bungalow and 5 terraced 2 storey properties). Potential visibility verified in field and excluded from further detailed assessment	
AP4	*Adjacent to P28 Pantglas	293161	300941	2289m	R39	Yes	4 Hubs/10 Tips	Yes	Converted barn, with shared driveway access with P28 Pantglas, located alongside minor road from Talerddig with potential visibility of the southern extent of the Proposed Development	✓
AP5	Gors	298996	310322	2621m	R40	None	0 Hubs/0 Tips	None	New build property which lies just beyond 2.5km boundary, but may experience potential views of Proposed Development. Potential visibility verified in field and excluded from further detailed assessment	
AP6	Rhosperfeydd	299061	310004	2506m	R40	Yes	20 Hubs/24 Tips	Yes	Property lies on just beyond 2.5km boundary, but may experience potential views of Proposed Development	✓

[24] Property is financially involved in the Carnedd Wen Development
[25] Additional properties (often new build or converted buildings) not included in Address Layer 2 and Address Base Plus data added to list of properties following observations in the field
[26] Property names unknown, One Bungalow and five two storey properties recently constructed under planning consent: P/2008/1155

1.6 Assessment of Changes to Views and Visual Amenity

1.6.1 A detailed account of potential changes to views from each of the residential properties included in the detailed assessment (see **Appendix Table 4.1**) is provided in the pages which follow.

P1 Pen Yr Eisteddfod		**Appendix 4.1, Figure 2a-b**
OS Grid Reference	297941	310870
Distance to nearest turbine & turbine no.	2252m	R40
Potential No. of turbines visible (hubs & tips)	1 Hub	3 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	9˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	26˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	27˚	

Description of property and existing views

This two storey farmhouse property lies at the head of the steep sided valley of Nant Pen-y-cae, with primary views focused south-east across the valley. Agricultural outbuildings lie to the east and north of the property, enclosed by deciduous and coniferous boundary trees and hedgerows which screen views to the east and north. Views south-west towards the Development Site are available from the rear curtilage of the property.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development are unlikely to be perceptible from this property or the surrounding curtilage due to the presence of coniferous forestry located on the skyline to the south-west. The property would therefore experience a barely perceptible magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

Carnedd Wen Wind Farm would be visible to the south-west when approaching the property and from the curtilage to the west and south of the property. They would appear above the skyline formed by the

coniferous forestry of Gwrachen and the shallow valley of Nant Pen-y-cae to the south-west.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would be barely perceptible beyond the turbines of Carnedd Wen, screened by coniferous forestry to the south-west of the property. There would therefore be a barely perceptible magnitude of cumulative change to the view.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account the views from the primary outlook of the property and its curtilage, the distance from the development and the presence of agricultural buildings and intervening coniferous forestry, is considered to be barely perceptible. The magnitude of cumulative change to the visual amenity of this property, given the presence of the Carnedd Wen development in the view is considered to be barely perceptible.

P2 Caecrwn		Appendix 4.1, Figure 3a-c
OS Grid Reference	298046	310849
Distance to nearest turbine (& turbine no.)	2290m	R40
Potential No. of turbines visible (hubs & tips)	1 Hub	3 Tips
Primary Outlook/ Orientation of Property	South, south-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	10˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	52˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	54˚	

Description of property and existing views
This two storey property lies to the north of the minor road and affords open views south-east across the valley from the primary outlook. Views south-west from the property and curtilage are partially contained by the presence of outbuildings and coniferous and deciduous hedgerows to the western and southern boundaries of the curtilage.
Description of likely views of the Proposed Development from the property
The turbines of the Proposed Development are unlikely to be perceptible from this property or the surrounding curtilage due to the presence of coniferous forestry located on the skyline to the south-west. The property would therefore experience a barely perceptible magnitude of change to views as a result of the Proposed Development.
Description of likely views of Carnedd Wen Wind Farm from the property
Carnedd Wen Wind Farm would be visible across a large proportion of the skyline to the south-west of this property, with turbines appearing as large features above the coniferous forestry of Gwrachen when approaching the property from the east and from the curtilage of the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would be barely perceptible beyond the turbines of Carnedd Wen, with visibility screened by coniferous forestry to the south-west of the property and there would therefore be a barely perceptible magnitude of cumulative change to the view.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account the views from the primary outlook of the property and its curtilage, the distance from the development and the presence of intervening coniferous forestry is considered to be barely perceptible. The magnitude of cumulative change to the visual amenity of this property, given the presence of the Carnedd Wen development in the view is considered to be barely perceptible.

P4 Llety Bach		Appendix 4.1, Figure 4a-c
OS Grid Reference	298827	310247
Distance to nearest turbine (& turbine no.)	2424m	R40
Potential No. of turbines visible (hubs & tips)	16 Hubs	20 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	13˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	35˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	43˚	

Description of property and existing views
This two storey new build property lies in an elevated position above the shallow valley to the north of Pen Coed. The conservatory located on the primary south-east outlook of the property affords open views across the surrounding enclosed agricultural landscape with long distance views possible south, south-west across the open moorland of Pen Coed and the Development Site, towards the distant turbines of Carno Wind Farm, and long distance views south-east towards the low lying Afon Banwy river valley. Deciduous trees and hedgerows directly west of the property partially screen visibility to the west.
Description of likely views of the Proposed Development from the property
A proportion of the Proposed Development would be visible from the conservatory and curtilage of the property, appearing above the open moorland and coniferous forestry which forms the skyline to south-west of the property. The turbines would not form the main focus of the available views from the property and would be partially screened by deciduous vegetation located to the west of the property, therefore the magnitude of change in views is considered to be medium from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
Visibility of the proposed turbines of Carnedd Wen would be limited to blade tips to the west, appearing above the rising landform to the west of the property, and turbines located beyond the nearest turbines of the Proposed Development.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear further away than those of the closest turbines of Carnedd Wen Wind Farm extending visibility of turbines across the skyline to the south-west. However given that the turbines of Carnedd Wen would be barely perceptible to the north-west of the property and the turbines, the magnitude of cumulative change is considered to be low.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account the views from the primary outlook of the property and its gardens and curtilage, the distance from the development and the presence of intervening tree and hedgerows is considered to be low. The magnitude of cumulative change to the visual amenity of this property, given the presence of the Carnedd Wen in the view is considered to be low.

P5 Llety Mawr		Appendix 4.1, Figure 5a-c
OS Grid Reference	298836	310271
Distance to nearest turbine (& turbine no.)	2445m	R40
Potential No. of turbines visible (hubs & tips)	16 Hubs	18 Tips
Primary Outlook/ Orientation of Property	South, south-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	13˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	35˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	43˚	

Description of property and existing views

This two storey property lies in an elevated position on the slopes of the valley north of Pen Coed. The primary outlook of the property is south, south-east across the valley, with long distance views possible south-west towards the Development Site and south-east to the low lying river valley of Afon Banwy. Long distance views north, north-east towards Dyfnant Forest are also possible from the curtilage and access drive to the property.

Description of likely views of the Proposed Development from the property

A proportion of the Proposed Development would be visible from the curtilage and gardens of the property, appearing above the open moorland which forms the skyline to south-west of the property; however the adjacent property and deciduous vegetation to the west of the property would screen views of some turbines. The turbines would not form the main focus of the available views from the property and therefore the magnitude of change in views is considered to be medium from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

Visibility of the proposed turbines of Carnedd Wen Wind Farm would be limited to blade tips to the west

appearing above the rising landform to the west of the property, with a small number of more distant turbines located to the west.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
Given that the turbines of Carnedd Wen Wind Farm would be largely imperceptible from this property, the introduction of the Proposed Development would lead to a low magnitude of cumulative change; where by the turbines of the two developments would appear as one wind farm.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account the views from the primary outlook of the property and its gardens and curtilage, the distance from the development and the presence of intervening tree and hedgerows is considered to be low. The magnitude of cumulative change to the visual amenity of this property, given the presence of the Carnedd Wen Wind Farm in the view is considered to be low.

P6 Ffridd Newydd		Appendix 4.1, Figure 6a-c
OS Grid Reference	298529	309887
Distance to nearest turbine (& turbine no.)	1984m	R40
Potential No. of turbines visible (hubs & tips)	24 Hubs	29 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	37˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	40˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	49˚	

Description of property and existing views

This two storey stone property lies in the shallow valley of Nant Nodwydd to the north of Pen Coed, and is accessed by a long track from the south-east through the surrounding rough grazed farmland. The property affords a south-easterly primary outlook with views across the valley to the open moorland skyline of Pen Coed, and views also available from the conservatory located on the eastern gable end of the property. Deciduous and confierous trees lie to the west of the property and limiting views west, southwest from the property. Views south-west towards the Development Site exist from the curtilage and access track to the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the curtilage and access track of the property, appearing above the open moorland and coniferous forestry which forms the skyline to the south-west. Due to the presence of vegetation located to the west and the south-easterly primary outlook of the property, it is considered that the magnitude of change in views from this property would be medium.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen Wind Farm would appear beyond the open moorland and coniferous forestry west of the property in views from the access track and curtilage. The vegetation and steep landform directly west of the property would screen most visibility of turbines from the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear closer to, and therefore of a slightly larger scale than the visible turbines of the Carnedd Wen Wind Farm and would increase the spread of turbines across the skyline to the south-west and increase the density and spread of turbines visible from the property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account the views from the primary outlook of the property and its gardens and curtilage and the presence of intervening deciduous and coniferous tree cover and hedgerows, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear alongside those of Carnedd Wen Wind Farm, is considered to be low.

P7 Bryn Du		Appendix 4.1, Figure 7a-c
OS Grid Reference	298655	309689
Distance to nearest turbine (& turbine no.)	2013m	R40
Potential No. of turbines visible (hubs & tips)	11 Hubs	16 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	155˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	80˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	155˚	

Description of property and existing views

This two storey property lies at the foot of the shallow valley alongside Nant Nod wydd, north of Pen Coed. The property is enclosed by deciduous woodland in all directions, with outbuildings located to the south-west and north and steep topography directly north of the property. Views southwest towards the Development Site are enclosed by deciduous vegetation and the surrounding topography, however pitched views south, south east to the open moorland ridge of Pen Coed exist from the primary outlook and curtilage of the property.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development lie to the south-west of the property, appearing above open moorland and coniferous forestry when approaching the property via the minor road from the north-east. Turbines would however be barely perceptible from the property and curtilage due to the presence of dense vegetation and outbuildings to the south-west of the property. This would result in a low magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

Carnedd Wen Wind Farm would occupy a similar proportion of the available view when approaching the property, with turbines appearing perceptually quite close to the property. The presence of dense vegetation and outbuildings to the west, south-west of the property would screen the majority of visibility from the property and curtilage.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear further away, and therefore of a slightly smaller scale than the visible turbines of the Carnedd Wen Wind Farm, however they would increase the spread of turbines across the skyline to the south-west and increase the density and spread of turbines visible from the property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account the views from both the access track and the primary outlook of the property and its curtilage, and the presence of intervening topography and tree cover, is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear alongside those of Carnedd Wen Wind Farm, is considered to be low.

P8 Ysgubor Cannon		Appendix 4.1, Figure 8a-e
OS Grid Reference	295943	307427
Distance to nearest turbine (& turbine no.)	864m	R17
Potential No. of turbines visible (hubs & tips)	10 Hubs	15 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North, south-west, west	
Approximate angle of view potentially affected by turbines of the Proposed Development	155˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	85˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	155˚	

Description of property[27]

A two storey stone property located at the head of the narrow Afon Cannon valley. The property lies in the foot of the valley beyond a large area of agricultural buildings to the east, south-east which screen views along the valley. Deciduous woodland lines the river valley to the west of the property and coniferous forestry to the east and north-west forms the skyline atop the steep slopes of the valley. Pitched views towards the higher ground of the Development Site are available from the primary outlook and curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the primary outlook and curtilage of the property, with turbines appearing across the higher ground of the Development Site, atop the valley slopes of Afon Cannon. Deciduous woodland and coniferous forestry blocks would provide some screening of more distant turbines, however the closest turbines would appear as large features above the skyline in views from this property. This would result in a high magnitude of change in views from this property.

[27] Property financially involved in the Llanbrynmair Wind Farm Development

Description of likely views of Carnedd Wen Wind Farm from the property
Approximately five turbines of Carnedd Wen Wind Farm would be visible above the ridgeline of the upper slopes of Afon Cannon west of the property, appearing above the coniferous forestry and deciduous woodland which forms the middle distance of the view.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear closer to the residential property than those of Carnedd Wen Wind Farm; however in views from the property the turbines would appear as one wind farm, with the majority of turbines of both developments screened by intervening forestry to the west and south-west of the property.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook and curtilage of the property, and the access track to the south-east, is considered to be high. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be high. **In considering the effect of visual amenity "in the round", there is no doubt that there would be a significant change in view, whilst noting the high magnitude of change from the property, curtilage and access, overall it is judged that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P9 Cannon		Appendix 4.1, Figure 9a-h
OS Grid Reference	295885	307418
Distance to nearest turbine (& turbine no.)	811m	R17
Potential No. of turbines visible (hubs & tips)	10 Hubs	17 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North, south-west, west	
Approximate angle of view potentially affected by turbines of the Proposed Development	155˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	85˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	155˚	

Description of property and existing views[28]

A two storey farmhouse located at the head of the narrow Afon Cannon valley which lies beyond agricultural buildings to the south-east of the property. Views from the primary outlook and gardens of the property are contained by deciduous and coniferous trees to the north and east of the property; however views are possible south-east along the river valley. The steep slopes and coniferous forestry west of the property limit views to the higher ground of the Development Site from the curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the upper windows and curtilage of the property, with turbines appearing above the ridge line formed by the steep valley slopes of Afon Cannon, west of the property. Deciduous woodland and coniferous forestry blocks would provide some screening of turbines, however the closest turbines would appear as large features above the skyline in views from this property. This would result in a high magnitude of change in views from this property.

[28] Property financially involved in the Llanbrynmair Wind Farm Development

Description of likely views of Carnedd Wen Wind Farm from the property
Approximately five turbines of Carnedd Wen would be visible above the ridgeline of the upper slopes of Afon Cannon west of the property, appearing above the coniferous forestry and deciduous woodland which forms the middle distance of the view. The steep slopes of the river valley directly west of the property would limit visibility of turbines from the curtilage of the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear closer to the residential property than those of Carnedd Wen Wind Farm; however in views from the property the turbines would appear as one wind farm, with the majority of turbines of both developments screened by intervening forestry to the west and south-west of the property.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the potential views of turbines from the upper windows, gardens and curtilage of the property, and the access track to the south-east, is considered to be high. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be high. **In considering the effect of visual amenity "in the round", there is no doubt that there would be a significant change in view, whilst noting the high magnitude of change from the upper storey of the property, curtilage and access, overall it is judged that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P10 Dolwen Uchaf		Appendix 4.1, Figure 10a-e
OS Grid Reference	297495	307619
Distance to nearest turbine (& turbine no.)	1087m	R43
Potential No. of turbines visible (hubs & tips)	12 Hubs	25 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	West, north-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	100˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	95˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	120˚	

Description of property and existing views[29]

A Two storey farmhouse located within a low lying valley east of the Development Site, alongside a minor tributary of Afon Gam. Agricultural buildings and hardstanding lie to the north, east and south of the property, containing views outwith the boundaries of the farm, and steep landform directly west of the property limits views towards the Development Site. Scattered deciduous trees further screen views from the curtilage of the property.

Description of likely views of the Proposed Development from the property

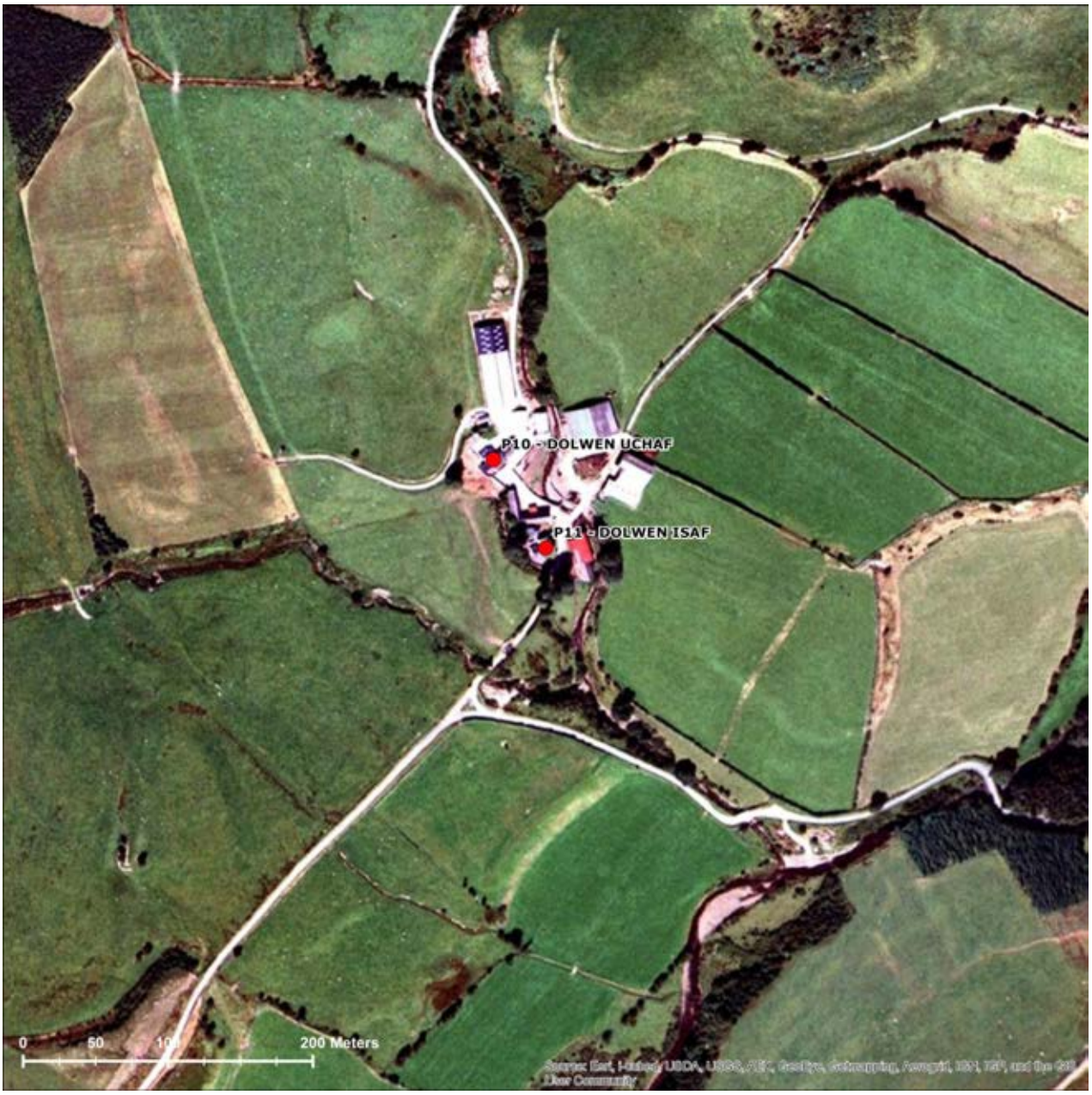
The Proposed Development would be barely perceptible from this property, screened by the steep landform to the west, however visibility from the surrounding curtilage and farm buildings would be possible, with turbines appearing above the surrounding pasture fields to the west and north-west of the property. This would result in a medium magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

[29] Property financially involved in the Llanbrynmair Wind Farm Development

The turbines of Carnedd Wen Wind Farm would appear above the skyline of the surrounding pasture fields north-west of the property. The most northerly turbines of Carnedd Wen Wind Farm would extend the angle of view occupied by turbines, to the north-west.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear closer to the residential property than those of Carnedd Wen Wind Farm, however the turbines would appear as one wind farm, with turbines visible to varying proportions. The turbines closest to the property would be visible in pitched views from the curtilage of the property, with the turbines of Carnedd Wen appearing more distant beyond the Proposed Development.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook and the surrounding curtilage, farm buildings and access track to the south, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be medium.

P11 Dolwen Isaf		Appendix 4.1, Figure 11a-e
OS Grid Reference	297531	307558
Distance to nearest turbine (& turbine no.)	1157m	R43
Potential No. of turbines visible (hubs & tips)	25 Hubs	28 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	West, north-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	100˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	95˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	120˚	



Description of property and existing views

Two storey property located at the entrance to this large farm, with agricultural buildings and hardstanding located to the east and north of the property. The property sits elevated above the surrounding farm yard, but is contained by deciduous and coniferous trees and steep landform to the west of the property, which screens views towards the Development Site from the ground floor and curtilage of the property. Views from the primary outlook of the property are focused southeast along the broad valley of Nant yr Eira.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would be visible from the curtilage and upper storey west facing windows, appearing across a large proportion of the available view to the west, north-west of the property. The steep landform and vegetation located along the western boundary of the curtilage would screen visibility of turbines from the ground level of the property, and turbines would not be visible from the primary outlook of the property. It is considered that the Proposed Development would lead to a medium magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen Wind Farm would appear west, south-west and north-west of this property. The most northerly turbines of the development would appear large above the underlying pasture fields and coniferous forestry.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
Although the turbines of the Proposed Development would not substantially increase the spread of turbines visible in views from this residential property, the turbines would appear closer to the residential property than those of Carnedd Wen Wind Farm; however the turbines would appear as one wind farm, with turbines visible to varying proportions.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook and the surrounding curtilage, farm buildings and access track to the south, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be medium.

P12 Moelddolwen		Appendix 4.1, Figure 12a-b
OS Grid Reference	299212	307781
Distance to nearest turbine (& turbine no.)	2491m	R43
Potential No. of turbines visible (hubs & tips)	2 Hubs	4 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	West, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	6˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

This two storey farmhouse is located in an elevated position above the Afon Gam river valley. Affording a south-easterly outlook over the wooded river valley, with views north and west contained by the steep landform and deciduous woodland to the west of the property. Agricultural buildings located to the north-east of the property limit views north-east along the river valley.

Description of likely views of the Proposed Development from the property

The Proposed Development would be barely perceptible from this property, with visibility limited to views of less than three turbine blades and hubs from the curtilage of the property. The presence of deciduous woodland west of the property would likely screen any available visibility of turbines from this property and curtilage. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion

The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook and the surrounding curtilage and farm buildings, and the presence of intervening topography and tree cover, is considered to be barely perceptible.

P13 Abercannon		**Appendix 4.1, Figure 13a-f**
OS Grid Reference	296276	306932
Distance to nearest turbine (& turbine no.)	1011m	R42
Potential No. of turbines visible (hubs & tips)	17 Hubs	19 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North, West, South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	155˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	140˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	155˚	

Description of property and existing views[30]

A two storey farmhouse located west of Afon Cannon and accessed via a private track from the hamlet of Neinthirion to the south. Agricultural buildings are located to the east, north and south of the property, and deciduous trees located to the west and north screen views from the property and curtilage. Views from the primary outlook of the property are across pasture fields to the broad valley of Nant yr Eira.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible in views north, west and south-west from the curtilage and upper storey windows of the property, with turbines appearing across the skyline formed by the open moorland and coniferous forestry. The more distant turbines to the north and south-west are likely to be screened by the presence of coniferous forestry in the middle distance of views from the property and curtilage. The magnitude of change in views from this property is considered to be high.

Description of likely views of Carnedd Wen Wind Farm from the property

[30] Property financially involved in the Llanbrynmair Wind Farm Development

The turbines of Carnedd Wen would potentially be visible in views west from the curtilage of the property, appearing above the skyline formed by the open moorland and coniferous forestry. Visibility of turbines located to the north-west of the property is likely to be screened by the presence of coniferous forestry in the middle distance.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would substantially increase the spread of turbines visible alongside the turbines of Carnedd Wen Wind Farm in views from this residential property. The turbines would appear closer to the residential property than those of Carnedd Wen Wind Farm; however the turbines would appear as one wind farm, with turbines of the two developments visible to varying proportions.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the upper storey windows, surrounding curtilage and the private access track to the south, is considered to be high. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be high. **In considering the effect of visual amenity "in the round", there is no doubt that there would be a significant change in view, whilst noting the high magnitude of change from the upper storey of the property, curtilage and access, overall it is judged that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P14 Hafod Y Beudy		Appendix 4.1, Figure 14a-b
OS Grid Reference	298907	307166
Distance to nearest turbine (& turbine no.)	2462m	R43
Potential No. of turbines visible (hubs & tips)	6 Hubs	6 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	15˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	30˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	30˚	

Description of property and existing views

Two storey farmhouse property located on the southern slopes of the valley overlooking the wooded river of Afon Gam. Large agricultural buildings located north and west of the property limit views outwith the farm yard and curtilage of the property. Deciduous woodland and coniferous forestry blocks further screen views northwest along the river valley towards the Development Site. Views from the primary outlook of the property are across pasture fields and east along the river valley.

Description of likely views of the Proposed Development from the property

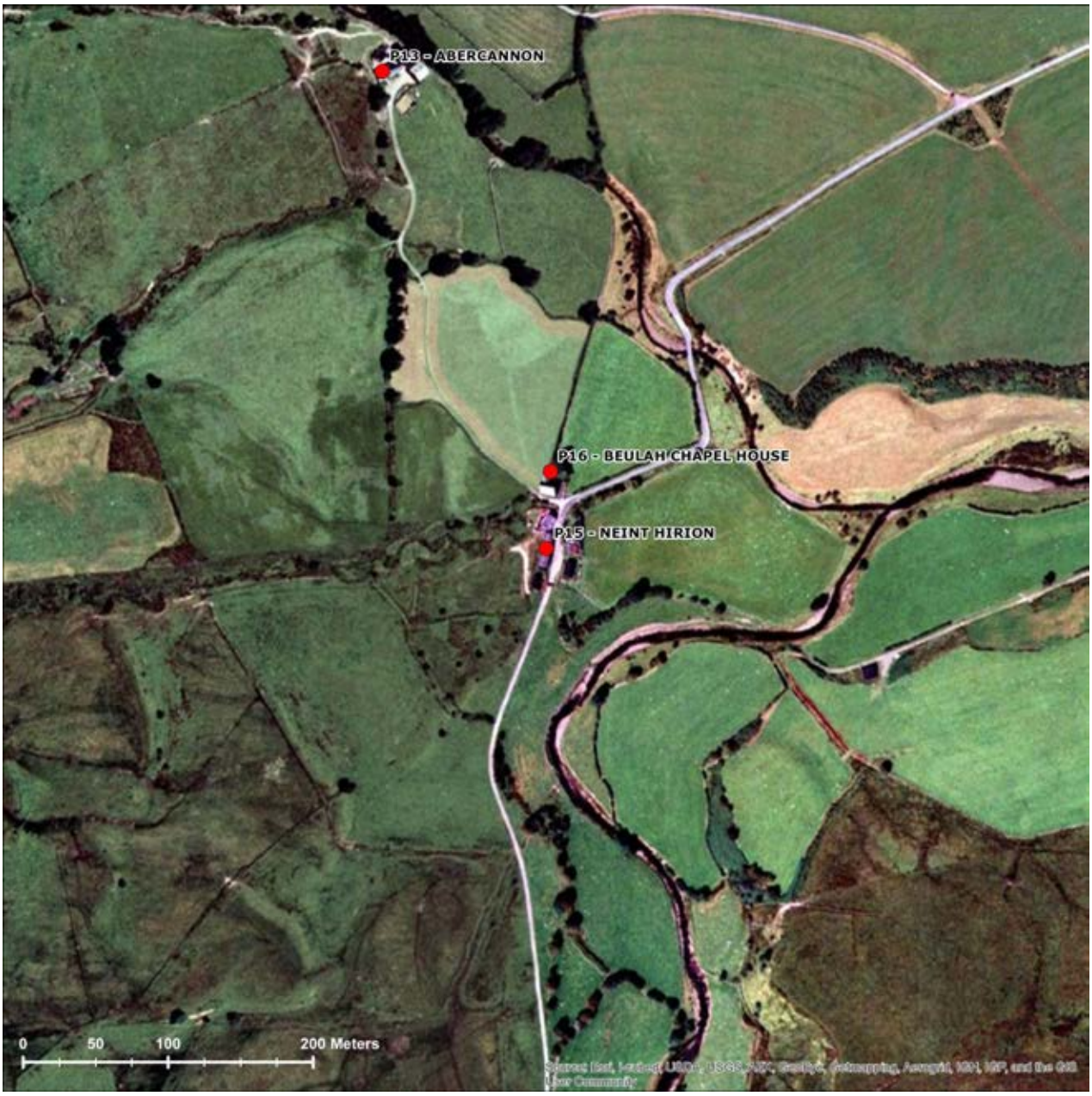
The Proposed Development would be screened in views from the ground level and curtilage of the property by the agricultural buildings and tree cover located west of the property. Visibility of turbines may be possible however from the upper storey windows on the north-west façade of the property, with turbines appearing above the open moorland and coniferous forestry which forms the skyline in distant views to the north-west. This would result in a low magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

A large number of turbines of Carnedd Wen Wind Farm would potentially be visible from this property

and would be visible above the coniferous forestry to the north-west.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer alongside the turbines of Carnedd Wen Wind Farm, however they would occupy a relatively small proportion of the available views from this residential property. The turbines would appear as one wind farm from this property in views to the north-west.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the upper storey windows, gardens and surrounding curtilage, and the presence of intervening topography and coniferous forestry, is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be low.

P15 Neint Hirion		Appendix 4.1, Figure 15a-e
OS Grid Reference	296389	306603
Distance to nearest turbine (& turbine no.)	1050m	R42
Potential No. of turbines visible (hubs & tips)	16 Hubs	19 Tips
Primary Outlook/ Orientation of Property	East	
Direction of Views to Proposed Development	North, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	150˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	140˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	150˚	



Description of property and existing views

A two storey farmhouse property with outbuildings and stables located to the south and south-east. The property curtilage extends to the north of the property and to the east of the minor road, with gardens and allotments enclosed by deciduous hedgerows and small trees to the east. The primary outlook of the property is east across the minor road, to the adjacent outbuildings and vegetation, with views contained by the presence of these features and restricted to pitched views from the curtilage to the moorland and forestry and Ffridd Rhyd Ddu. Visibility of the Proposed Development would be possible from the rear of the property and in pitched views above the property and outbuildings from the curtilage, with turbines occupying a large proportion of the skyline clockwise from south-west to north-west.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the rear windows of this property and when approaching the property via the minor road to the east. The proposed turbines would occupy a large proportion of the view clockwise from south-west to northwest, appearing as large features above the open moorland and coniferous forestry which forms the skyline. Turbines would not be perceptible from

the primary outlook and would be limited to views north-west from the front curtilage of the property. This would result in a medium magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
A large number of turbines of Carnedd Wen Wind Farm would potentially be visible from this property. The turbines of Carnedd Wen would be visible across the skyline to the north-west to south-west of the property occupying a large proportion of the available view from this property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm; however they would not substantially increase the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the north-west.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook of the property would not be affected, the potential views of turbines from the gardens and the surrounding curtilage, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be medium.

P16 Beulah Chapel House		Appendix 4.1, Figure 16a-e
OS Grid Reference	296392	306656
Distance to nearest turbine (& turbine no.)	1057m	R42
Potential No. of turbines visible (hubs & tips)	17 Hubs	19 Tips
Primary Outlook/ Orientation of Property	East	
Direction of Views to Proposed Development	North, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	150˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	110˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	150˚	

Description of property and existing views

Two storey property which lies adjacent to Beulah Chapel. A stone wall enclosed garden lies to the front of the property, and the primary outlook affords views across this and the pasture fields beyond, partially filtered by the presence of deciduous trees and vegetation. Views west from the property are possible from small windows located to the rear of the property, across the adjacent enclosed rough grazing. Deciduous trees line the northern boundary of the curtilage and screen views northwards from the curtilage. The adjacent chapel screens views south from the property and curtilage. This property is currently derelict and uninhabited.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the rear windows of this property and when approaching the property via the minor road to the east. The proposed turbines would occupy a large proportion of the view clockwise from south-west to northwest, appearing as large features above the open moorland and coniferous forestry which forms the skyline. Turbines would not be perceptible from the primary outlook and would be limited to views north-west from the front curtilage of the property. This would result in a medium magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property
A large number of turbines of Carnedd Wen Wind Farm would be visible across the skyline to the north-west to south-west of the property occupying a large proportion of the available view from this property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm; however they would not substantially increase the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the north-west.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook of the property would not be affected, the potential views of turbines from the rear windows, gardens and surrounding curtilage of this currently uninhabited property, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be medium.

P17 Dolau		Appendix 4.1, Figure 17a-e
OS Grid Reference	297043	306755
Distance to nearest turbine (& turbine no.)	1715m	R42
Potential No. of turbines visible (hubs & tips)	23 Hubs	27 Tips
Primary Outlook/ Orientation of Property	North, north-west	
Direction of Views to Proposed Development	North-west, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	140˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	110˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	145˚	

Description of property and existing views

Two storey farmhouse located adjacent to Nant yr Eira within the broad low lying valley to the east of the Development Site. Enclosed gardens are located to the north façade of the property and large agricultural buildings are located to the south-west, north-west and east of the property screen some views from ground level along the river valley. A coniferous forestry plantation is located north of the property to the west of the river corridor. Views from the primary outlook of the property are partially screened by the presence of vegetation and trees located to the north of the property, however pitched views towards the Development Site are possible from the curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the primary outlook of the property, the surrounding curtilage and from the access track when leaving the property. Turbines would be visible across a large proportion of the available view, clockwise from the south-west to north-west, appearing above the skyline formed by the coniferous forestry plantation in the middle ground, and open moorland and coniferous forestry of the Development Site. This would result in a medium magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen Wind Farm would potentially be visible from this property, occupying a large proportion of the skyline to the west, north-west of the property. The turbines would appear above the underlying rough grazed pasture, open moorland and coniferous forestry.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm; however they would not substantially increase the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the north-west.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook of the property and the potential views of turbines from gardens and surrounding curtilage of the property and the presence of intervening coniferous forestry and agricultural outbuildings, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be medium.

P18 Dolau Ceimion		Appendix 4.1, Figure 18a-e
OS Grid Reference	296395	305841
Distance to nearest turbine (& turbine no.)	1272m	R42
Potential No. of turbines visible (hubs & tips)	26 Hubs	29 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	150˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	110˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	150˚	

Description of property and existing views[31]

Two storey farmhouse property located within the low lying river valley of Nant yr Eira to the east of the Development Site. A farmyard and agricultural outbuildings lie to the north-east and east of the property. The property is accessed by two tracks, from the west and the north. Deciduous trees are located along the river corridor to the east and to the rear of the property. West of the property steep topography screens views from the rear and immediate surrounding curtilage of the property. Views from the primary outlook of the property are focused south-eastwards towards Bryn y Castell and Ffridd Rhyd Ddu.

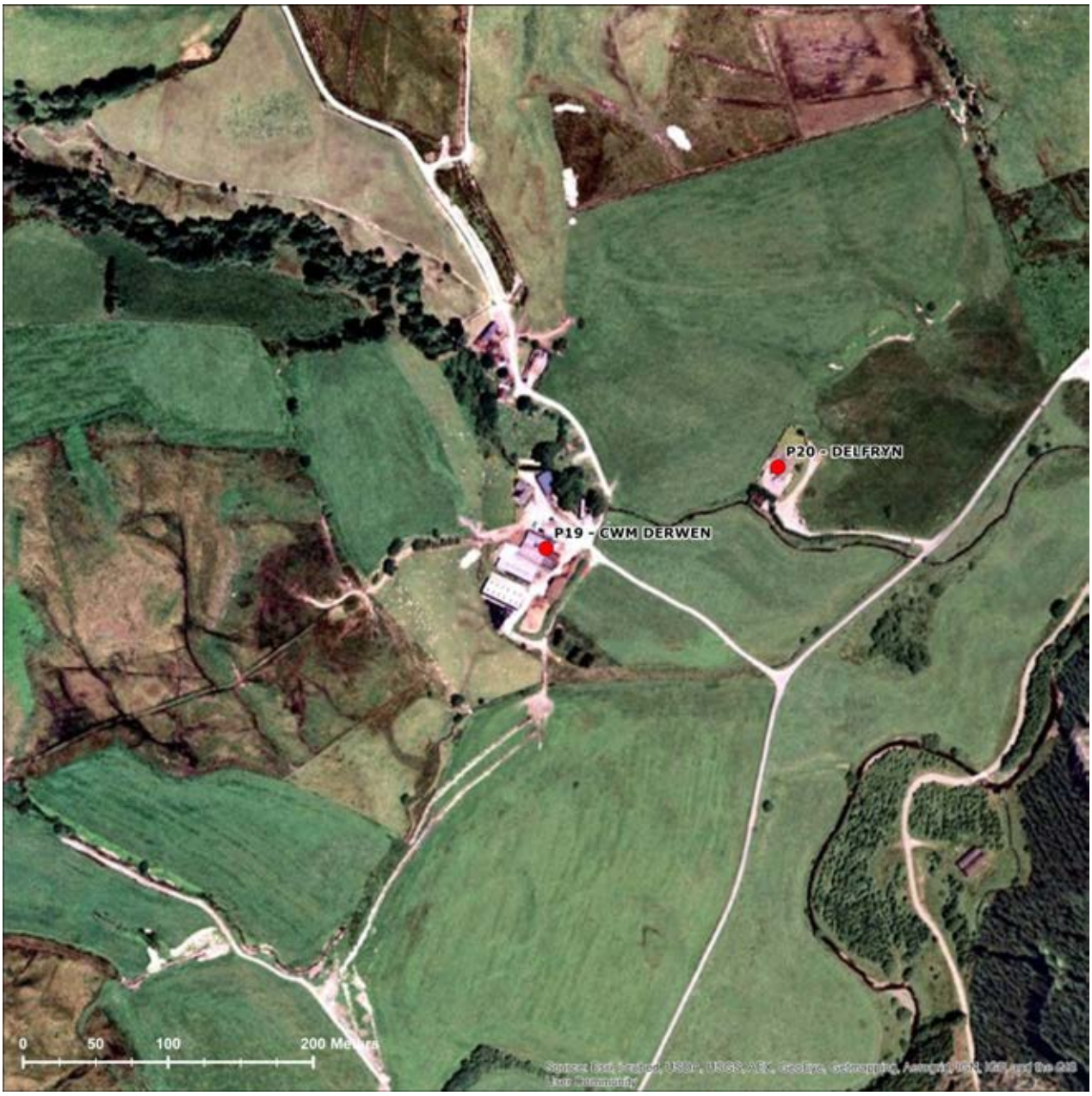
Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from the primary outlook or rear of the property, with views screened by the presence of steep topography to the rear of the property. Visibility of turbines would be possible from the access tracks to the west and north, and the curtilage surrounding the property to the east, north-east. Turbines would appear across a large proportion of the skyline,

[31] Property financially involved in the Llanbrynmair Wind Farm Development

clockwise from south-west to north-west, above the open moorland and coniferous forestry which forms the skyline in views from these locations. This would result in a low magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
A large number of turbines of Carnedd Wen Wind Farm would potentially be visible from this property, however due to the presence of steep topography directly to the rear (west) of the property, visibility of turbines would be limited to views experienced from the access track and curtilage of the property. The turbines would occupy a large proportion of the skyline to the west, north-west of the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm, while increasing the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the west, north-west.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account the views from the primary outlook of the property would not be affected and potential views of turbines would be limited to the access track and surrounding curtilage of this currently uninhabited property, is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be low.

P19 Cwm Derwen		Appendix 4.1, Figure 19a-f
OS Grid Reference	295551	305393
Distance to nearest turbine (& turbine no.)	887m	R23
Potential No. of turbines visible (hubs & tips)	11 Hubs	22 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	160˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	110˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	160˚	



Description of property and existing views[32]

Two storey farmhouse property, located east of the Development Site boundary. The property is accessed by a driveway from the minor road to the east, with large agricultural buildings located to the east and south of the property. Deciduous trees line the course of the small river to the north of the property and screen views directly north from the property and gardens to the north. A coniferous shelterbelt runs parallel to the access driveway to the south-east of the property. Pitched views towards the Development Site are possible from the property and curtilage with the open moorland, rough grazing and coniferous forestry of the Development Site forming the skyline in views west of the property.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would be visible above the open moorland and coniferous forestry which forms the skyline west of the property. Turbines would be visible from windows to the rear of the property, the surrounding curtilage and when approaching the property via the access

[32] Property financially involved in the Llanbrynmair Wind Farm Development

driveway from the south-east. The turbines would occupy a relatively large proportion of the skyline to the west, however turbines at the northern and southern extents of the Proposed Development would be barely perceptible due to the presence of coniferous forestry and intervening screening and turbines would not be perceptible from the primary outlook of the property. This would result in a high magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
Carnedd Wen Wind Farm would potentially be visible to the west of the property and the turbines would appear above the steep slopes leading down from the open moorland to the west. Turbine blades and hubs would be visible from the curtilage and access driveway when approaching the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm, while increasing the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the west, north-west.
Conclusion
Although views from the primary outlook of the property would not be affected by visibility of turbines, views from windows at the rear of the property, along with views from the access driveway, gardens and surrounding curtilage would have extensive visibility of turbines to the west of the property. Therefore the magnitude of change of the visual amenity of this property is considered to be high. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be high. **Whilst noting the high magnitude of change from the access driveway to the south-east, the curtilage and gardens of the property, and the limited availability of views from internal rooms, overall, it is judged that considering the changes in visual amenity 'in the round' that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P20 Delfryn		Appendix 4.1, Figure 20a-f
OS Grid Reference	295711	305449
Distance to nearest turbine (& turbine no.)	986m	R24
Potential No. of turbines visible (hubs & tips)	13 Hubs	25 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	160˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	110˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	160˚	

Description of property and existing views

Single storey property located within the Development Site boundary. The property sits within private grounds enclosed by deciduous trees and confierous hedgerows, with a conservatory located on the south-west gable of the property and accessed by a driveway to the east of the property. The primary outlook of the property is south-east across the surrounding rough grazing and pasture fields, however views north, west and south are screened by the presence of coniferous hedgerows, with views towards the Development Site limited to pitched views to the skyline formed by moorland and coniferous forestry west of the property.

Description of likely views of the Proposed Development from the property

Turbines of the Proposed Development would be visible from the conservatory on the south-west gable of the property, the surrounding curtilage and when approaching the property via the access driveway from the south-east. The presence of dense coniferous hedgerows which border the private gardens of the property screens views from the curtilage of the property, and would limit visibility of the Proposed Development to pitched views of turbines appearing above the skyline of open moorland and coniferous forestry, would occupying a relatively large proportion of the available skyline to the west. This would

result in a high magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

Carnedd Wen Wind Farm would potentially be visible to the west of the property above the steep sided valley of Nant y Graig Lwyd. The turbines would be visible above the open moorland which forms the skyline to the west. Visibility of turbines would be limited to views from the conservatory, the curtilage of the property and the access driveway when approaching the property.

Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property

The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm, while increasing the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the south-west and west.

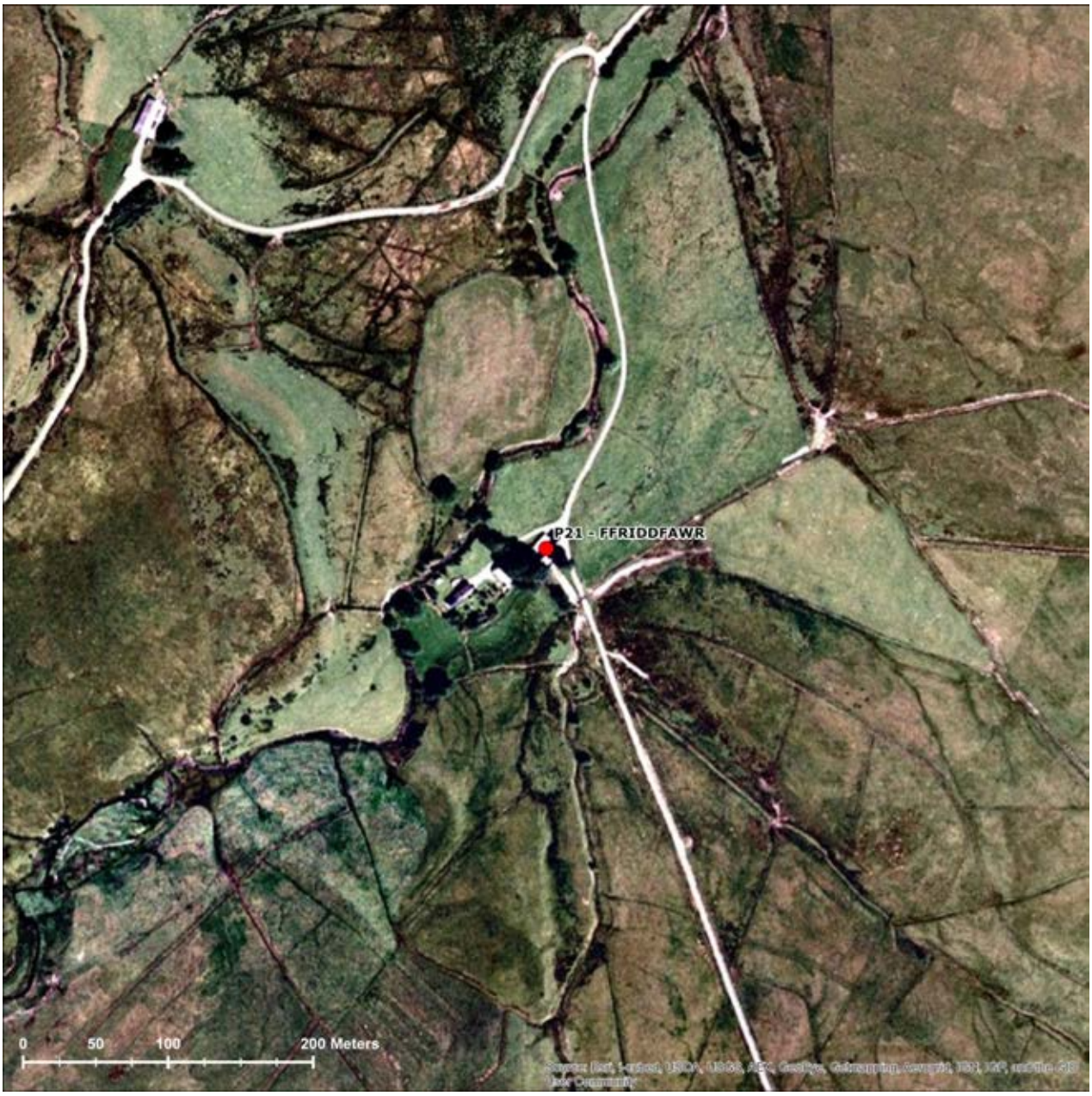
Conclusion

Although views from the primary outlook of the property would not be affected by visibility of turbines, views from windows at the rear of the property and the conservatory to the south-west, along with views from the access driveway, gardens and surrounding curtilage would have extensive visibility of turbines to the west of the property. Therefore the magnitude of change of the visual amenity of this property is considered to be high.

The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be high.

Whilst noting the high magnitude of change from the access driveway to the south-east, the curtilage and gardens of the property, and the limited availability of views from internal rooms, overall, it is judged that considering the changes in visual amenity 'in the round' that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.

P21 Ffriddfawr		Appendix 4.1, Figure 21a-f
OS Grid Reference	294686	303975
Distance to nearest turbine (& turbine no.)	926m	R9
Potential No. of turbines visible (hubs & tips)	21 Hubs	30 Tips
Primary Outlook/ Orientation of Property	North-west	
Direction of Views to Proposed Development	North, west, south-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	155˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	85˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	155˚	



Description of property and existing views

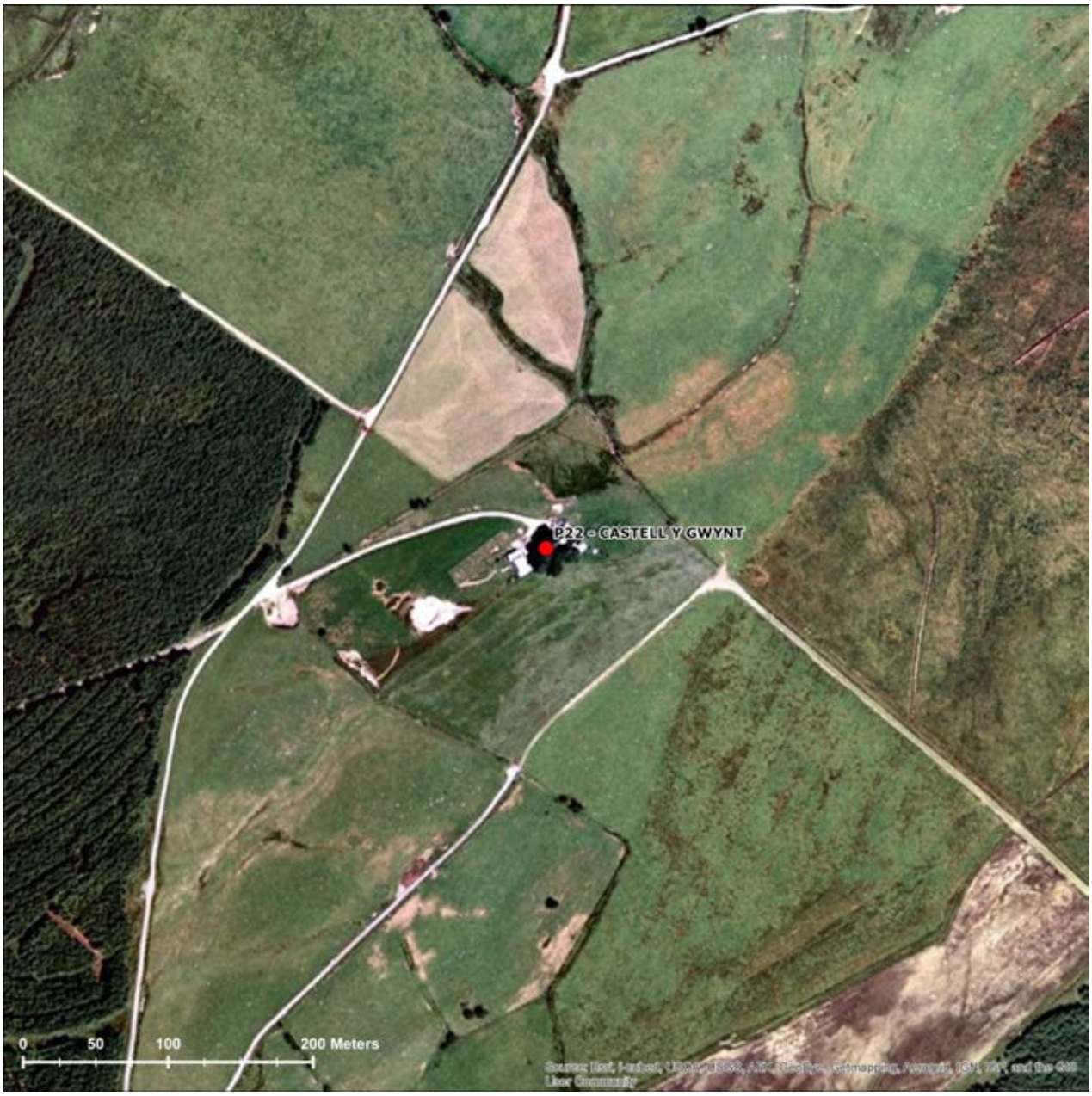
Two storey property located alongside the narrow river of Afon Gam. The property sits in a low lying position on the floor of the river valley and is enclosed by deciduous trees to the west, south and east. Outbuildings are located to the east of the property and screen views along the valley from the property and curtilage. Views from the primary outlook of the property are focused on the slopes which lie to the west and north of the property, and are partially screened by deciduous trees and vegetation located along the river corridor. Pitched views towards the Development Site are possible from the primary outlook and curtilage of the property, with the rough grazing and open moorland of the middle distance forming the skyline.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would be visible from the primary outlook, curtilage and access drive of the property, appearing beyond the skyline formed by the open moorland and rough grazing in the middle distance. The turbines would occupy a large proportion of the available view from this property and its surrounding curtilage, with the closest turbines to the west of the property appearing as large features above the skyline, often with overlapping turbine blades, especially in views

north along the valley towards the central and northern extents of the Proposed Development layout. This would result in a high magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen Wind Farm would potentially be visible in views north from the primary outlook and curtilage of the property, however views of turbines would be largely limited to turbine blades, with turbine towers and nacelles often screened by intervening topography and coniferous forestry. The turbines would be visible above the open moorland which forms the skyline to the west, north-west in views from this property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, alongside the turbines of Carnedd Wen Wind Farm, while increasing the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the west and north-west.
Conclusion
Views from the primary outlook of the property would be affected by visibility of turbines, along with visibility from the access driveway, gardens and surrounding curtilage, which would have extensive visibility of turbines to the north and west of the property. However, the presence of steep topography and intervening tree and shrub cover would limit visibility to the eastern extents of the Proposed Development. Therefore the magnitude of change of the visual amenity of this property is considered to be high. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, while extending the proportion of the available views occupied by turbines, is considered to be high. **Whilst noting the high magnitude of change from the primary outlook of the property, the access driveway to the east and the curtilage and gardens of the property, alongside the limited availability of views from internal rooms, overall, it is judged that considering the changes in visual amenity 'in the round' that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P22 Castell Y Gwynt		Appendix 4.1, Figure 22a-e
OS Grid Reference	294882	302964
Distance to nearest turbine (& turbine no.)	1360m	R39
Potential No. of turbines visible (hubs & tips)	30 Hubs	30 Tips
Primary Outlook/ Orientation of Property	North-west	
Direction of Views to Proposed Development	North-west, north	
Approximate angle of view potentially affected by turbines of the Proposed Development	100˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	70˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	100˚	



Description of property and existing views

Single storey property located in an elevated position on the ridge between the broad valley of Afon Gam to the north-west and Afon Tyn-y-rhos to the south-east. The property is accessed by a long access track from the west and outbuildings, kennels and fenced enclosures lie to the west of the property, with a number of motor vehicles occupying an area to the east of the property. A cluster of deciduous trees are located to the south of the property. The property affords elevated open views clockwise from west to north-east, with views south and east largely screened by the presence of outbuildings and deciduous trees. The full extent of the Development Site is clearly visible from the primary outlook and curtilage of the property, with the open moorland and coniferous forestry forming the skyline from south-west to north-east.

Description of likely views of the Proposed Development from the property

The Proposed Development would appear as a wide array of turbines across the skyline from south-west to the north-east, occupying a large proportion of the available view from the primary outlook and curtilage of the property. Turbines would be visible above the open moorland and coniferous forestry which forms the skyline beyond the broad valley of Afon Gam in the middle distance. The Proposed

Development would appear as almost two developments from this property without the presence of Carnedd Wen, with a perceptible gap between the northern and southern extents of the layout located around the coniferous forestry of Carreg y Frân. This would result in a high magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
The proposed turbines of Carnedd Wen Wind Farm would be visible from the primary outlook and curtilage of the property. Turbines would appear above the coniferous forestry of Carreg y Frân, across a relatively wide proportion of the skyline. The turbines of Carnedd Wen would extend north-westwards into the distance, in views from this property, with the most north-westerly turbines appearing perceptually much smaller.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear at a similar scale to those of Carnedd Wen Wind Farm, while increasing the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the west and north-west, occupying a large proportion of the available views from the primary outlook of the property. The two wind farms would appear as one single development in views from this property, with turbines often overlapping in views from the property and the surrounding curtilage.
Conclusion
Views from the primary outlook of the property would be affected by visibility of turbines, along with visibility from the access driveway, gardens and surrounding curtilage, which would have extensive visibility of turbines across a large proportion of the available view to the north-west and west of the property. Therefore the magnitude of change of the visual amenity of this property is considered to be high. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm is considered to be medium, as the proportion of the skyline occupied by the turbines of Carnedd Wen is much larger. **Whilst noting the high magnitude of change from the primary outlook of the property, the access driveway to the west along with the curtilage and gardens of the property, overall, it is judged that considering the changes in visual amenity 'in the round' that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P23 Pant Y Powsi		Appendix 4.1, Figure 23a-b
OS Grid Reference	294814	302372
Distance to nearest turbine (& turbine no.)	1517m	R39
Potential No. of turbines visible (hubs & tips)	0 Hubs	6 Tips
Primary Outlook/ Orientation of Property	North-west	
Direction of Views to Proposed Development	North-west, north	
Approximate angle of view potentially affected by turbines of the Proposed Development	26˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey property located at the head of the broad valley of the Afon Tyn-y-rhos, to the south-east of the Development Site. The property occupies a low lying position within the valley, with outbuildings located to the north. Enclosed rough grazing lies to the east and west of the property and rough moorland grazing to the north and south. The property is accessed by a private track from the south-west, and deciduous trees and vegetation are located the river corridor to the west and to the north-east and south-west of the property. Views from the primary outlook of the property, and the large decked area and patio which forms the western curtilage, are focused north-west, west across the adjacent river corridor to the ridge formed by the adjacent rough grazing and coniferous forestry of Tyn y Gors beyond.

Description of likely views of the Proposed Development from the property

Visibility of the Proposed Development would be limited to views of turbine blades above the ridge line to the north-west of the property. The blades would be barely perceptible in views from the property, with intervening deciduous vegetation and fence lines in the foreground and the presence of the coniferous forestry of Tyn y Gors in the middle distance screening potential visibility of turbines from

the primary outlook and curtilage of the property. Visibility of turbines may also be possible when approaching the property via the access track to the south-west of the property. This would result in a low magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook and the private gardens and curtilage of the property, is considered to be low.

P25 Capel Yr Aber		Appendix 4.1, Figure 24a-b
OS Grid Reference	293960	301839
Distance to nearest turbine (& turbine no.)	1422m	R39
Potential No. of turbines visible (hubs & tips)	0 Hubs	0 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North	
Approximate angle of view potentially affected by turbines of the Proposed Development	n/a	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property

Single storey property located close to the minor road south of the Development Site, and is accessed via a private access driveway to the south of the property. Outbuildings located to the south-west of the property. Deciduous trees and vegetation are located to the south and east of the property. Views from the property are contained by the presence of the rising landform north of the property and the deciduous trees and vegetation which enclose the curtilage of the property. Views towards the Development Site are possible from the access drive when approaching the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be barely perceptible from much of the property and curtilage, however views of turbines would be possible when approaching the property via the access driveway to the south. The turbines would appear above the adjacent landform to the north which rises up to the rear of the property, occupying a proportion of the skyline above Bryn Gwyn. The property would therefore experience a low magnitude of change to views as a result of the Proposed Development.

(The wireframe visualisations from this property represents the potential views available towards the Proposed Development from the property and immediate curtilage, and do not represent the views

experienced from the southern section of the access driveway where turbines would potentially be visible.)
Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change of the visual amenity of this property, taking into account views from the property and the immediate parts of the surrounding curtilage, is considered to be low. The magnitude of change to views from the access track when approaching the property is considered to be high. **Whilst noting the high magnitude of change for the access track, and limited visibility of the turbines from the property and gardens, overall, it is judged that considering the changes in visual amenity 'in the round' that the turbines would not appear dominant, oppressive or overwhelming such that the property would become an unattractive place in which to live.**

P26 Cwm Bach		Appendix 4.1, Figure 25a-b
OS Grid Reference	293868	301056
Distance to nearest turbine (& turbine no.)	2167m	R39
Potential No. of turbines visible (hubs & tips)	9 Hubs	13 Tips
Primary Outlook/ Orientation of Property	South-east, north-west	
Direction of Views to Proposed Development	North	
Approximate angle of view potentially affected by turbines of the Proposed Development	35˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	23˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	35˚	

Description of property and existing views

Two storey property accessed by long access track across pasture fields to the north. The property occupiers a slightly elevated position above the narrow river valley of Afon Tyn-y-rhos to the east. The property is enclosed by deciduous trees to the south and west which contain views in these directions, from the property and curtilage. The property affords open views to the east and north towards the Development Site, with intervening field boundary hedgerows and trees.

Description of likely views of the Proposed Development from the property

The Proposed Development would be visible from the property and curtilage, and when leaving the property via the access track to the north. The turbines would appear above the skyline formed by the middle distance topography of adjacent pasture fields and the confierous forestry which forms the skyline in the far distance. The intervening field boundary hedgerows and trees in the middle distance of views may provide partial screening of turbines. The Proposed Development would not form the main focus of the view, with views to the north-east and east unaffected by the presence of turbines. The property would therefore experience a low magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen Wind Farm are unlikely to be perceptible from this property due to the presence of intervening coniferous forestry on the far skyline to the north, north-west.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear in the foreground of those of Carnedd Wen Wind Farm and would increase the proportion of the available views occupied by turbines. The turbines would appear as one wind farm from this property in views to the west and north-west, with turbines often overlapping in views from the property and the surrounding curtilage.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, the access track approach and the private gardens and curtilage of the property, is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm is considered to be low, as the proportion of the skyline occupied by the turbines of Carnedd Wen is not substantially increased and visibility is reduced by the presence of intervening coniferous forestry.

P28 Pant Glas		Appendix 4.1, Figure 26a-b
OS Grid Reference	293171	300944
Distance to nearest turbine (& turbine no.)	2284m	R39
Potential No. of turbines visible (hubs & tips)	4 Hubs	10 Tips
Primary Outlook/ Orientation of Property	South, south-east	
Direction of Views to Proposed Development	North	
Approximate angle of view potentially affected by turbines of the Proposed Development	28˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	20˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	28˚	

Description of property and existing views

Single storey barn conversion property located adjacent to Pantglas, with outbuildings located to the west of the property, and a farmyard to the south. Deciduous trees surround the adjacent property to the east and contain views east and south-east from the property. Views from the primary outlook are directly towards the adjacent property, however open views exist from the southern extent of the property and curtilage to the south-west across adjacent pasture fields. Views north towards the Development Site are contained by the presence of localised topography alongside the road opposite and the deciduous trees which sit atop this.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would not be perceptible from this property due to the presence of intervening topography and deciduous trees and hedgerows surrounding the property. There may potentially be visibility of turbines from areas of the curtilage to the north-east of the property, where views are available above the vegetation which lines the boundary along the northern edge of the private gardens The property would therefore experience a low magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen are unlikely to be perceptible from this property due to the presence of intervening coniferous forestry in the middle distance to the north-west.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear in the foreground of those of Carnedd Wen Wind Farm, which would be barely perceptible and would increase the proportion of the available views occupied by turbines, however much visibility would be reduced by the presence of intervening screening from both deciduous and coniferous trees.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, the access track approach and the private gardens and curtilage of the property, is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm is considered to be low.

P32 Cefn		Appendix 4.1, Figure 27a-c
OS Grid Reference	292551	302071
Distance to nearest turbine (& turbine no.)	1501m	R39
Potential No. of turbines visible (hubs & tips)	17 Hubs	22 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North	
Approximate angle of view potentially affected by turbines of the Proposed Development	51˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	26˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	51˚	

Description of property and existing views

Two storey property accessed by long private access track across pasture fields from the south-east. The property is enclosed by deciduous trees to the north, west and south and a dense confierous forestry plantation to the east. Views outwith the property and curtilage are limited to filtered views through the deciduous trees and vegetation, with no views possible in the direction of the Proposed Development due to the presence of the coniferous forestry.

Description of likely views of the Proposed Development from the property

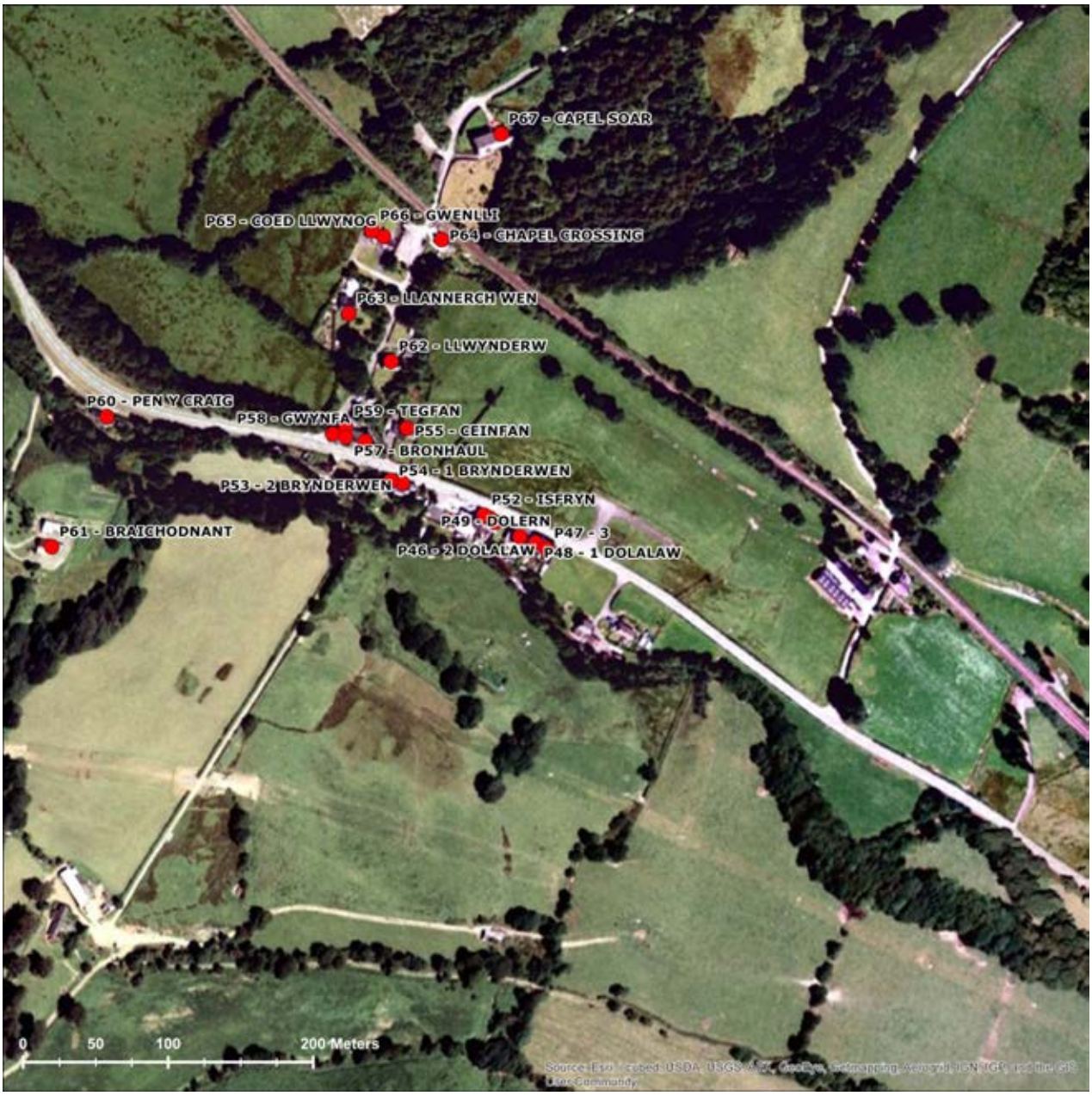
The Proposed Development would not be perceptible from this property or curtilage due to the presence of deciduous trees and coniferous forestry which enclose the property. Visibility of turbines of would be possible when approaching the property along the access track from the south-east, with turbine blades and hubs, occupying a proportion of the available view above the coniferous forestry in the middle distance. This would result in a low magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be perceptible from the property or curtilage, however turbines

would be visible from the access track when approaching the property from the east, south-east where turbines would appear above intervening coniferous forestry to the north, north-east of the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
Visibility of turbines of the Proposed Development would be limited to views from the access track to the east, south-east of the property where the turbines would appear closer and larger than those of Carnedd Wen Wind Farm, however much visibility would be reduced by the presence of intervening screening from both deciduous and coniferous trees.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the property and surrounding curtilage are contained by coniferous forestry and deciduous woodland, with visibility of turbines limited to views from the access track approach to the south-east, is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm is considered to be low. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm is considered to be low.

P46 2 Dolalaw		Appendix 4.1, Figure 28a-b
OS Grid Reference	291375	301674
Distance to nearest turbine (& turbine no.)	2261m	R32
Potential No. of turbines visible (hubs & tips)	0 Hubs	2 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	9˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. Private gardens to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east. Views south-east along the valley are possible from the rear curtilage and windows located on the gable end of the property.

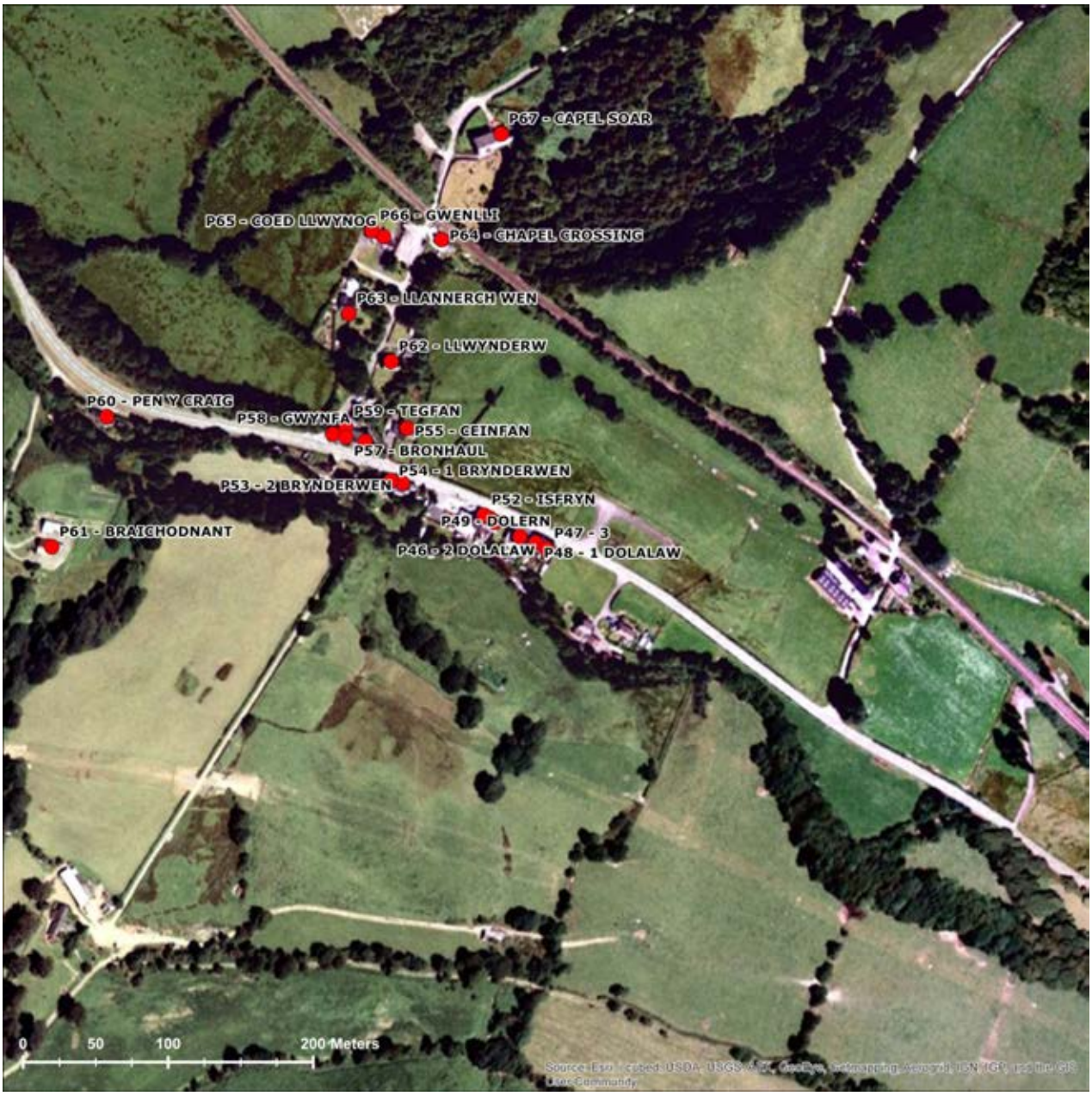
Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, is considered to be barely perceptible.

P47 3 Dolfach		Appendix 4.1, Figure 29a-b
OS Grid Reference	291375	301674
Distance to nearest turbine (& turbine no.)	2261m	R32
Potential No. of turbines visible (hubs & tips)	0 Hubs	2 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	9˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. Private gardens to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

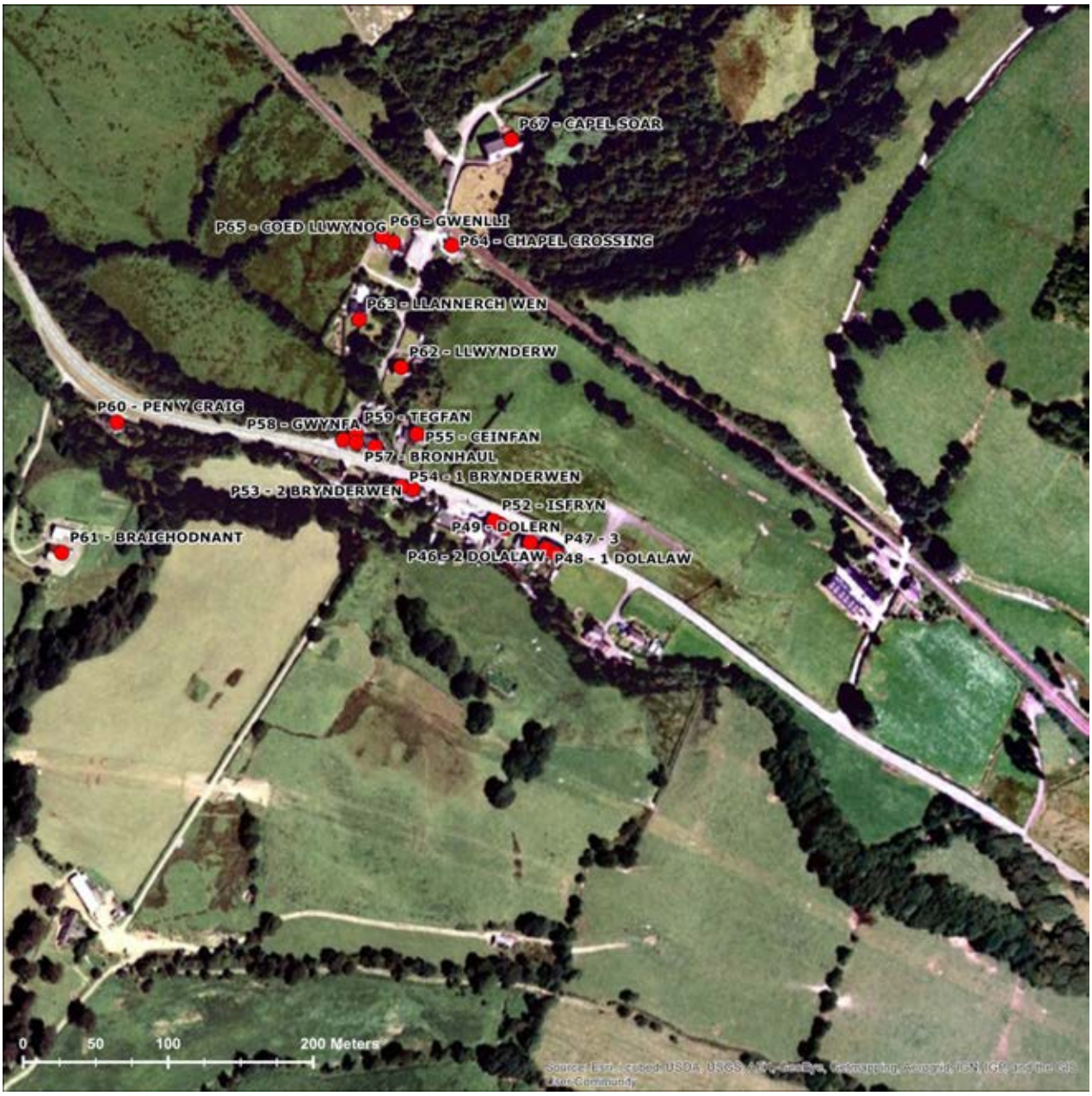
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, is considered to be barely perceptible.

P48 1 Dolalaw		Appendix 4.1, Figure 30a-b
OS Grid Reference	291368	301678
Distance to nearest turbine (& turbine no.)	2261m	R32
Potential No. of turbines visible (hubs & tips)	0 Hubs	3 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	9˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. Private gardens to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P49 Dolern		Appendix 4.1, Figure 31a-b
OS Grid Reference	291357	301682
Distance to nearest turbine (& turbine no.)	2263m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	3 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	10˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey detached property with front porch located alongside the A470 in Dolfach. Private gardens lie to the front and side of the property alongside the road and to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

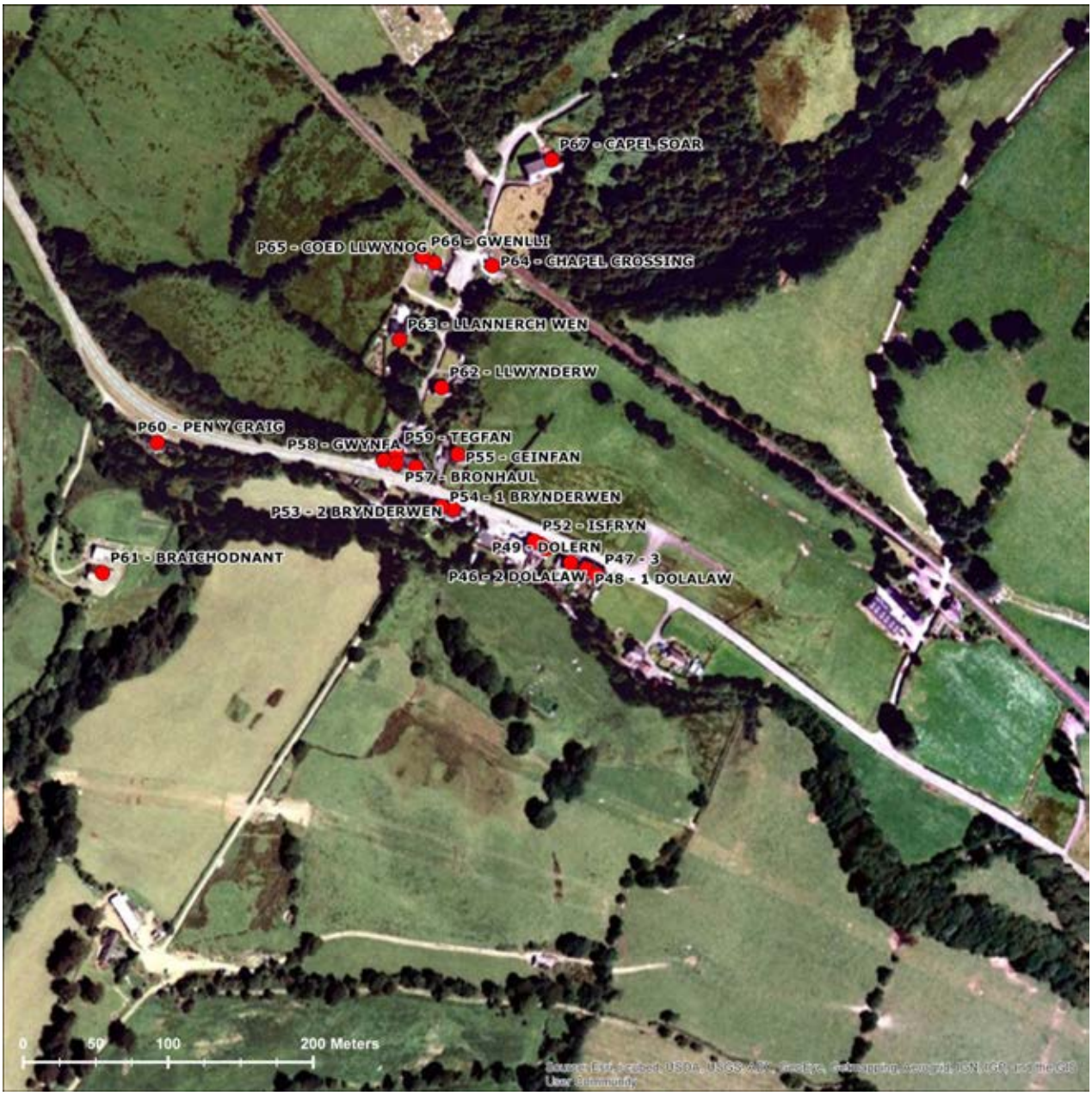
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P50 Brynmair		Appendix 4.1, Figure 32a-b
OS Grid Reference	291340	301692
Distance to nearest turbine (& turbine no.)	2264m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	4 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	10˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. Private gardens lie to the front of the property alongside the road and to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

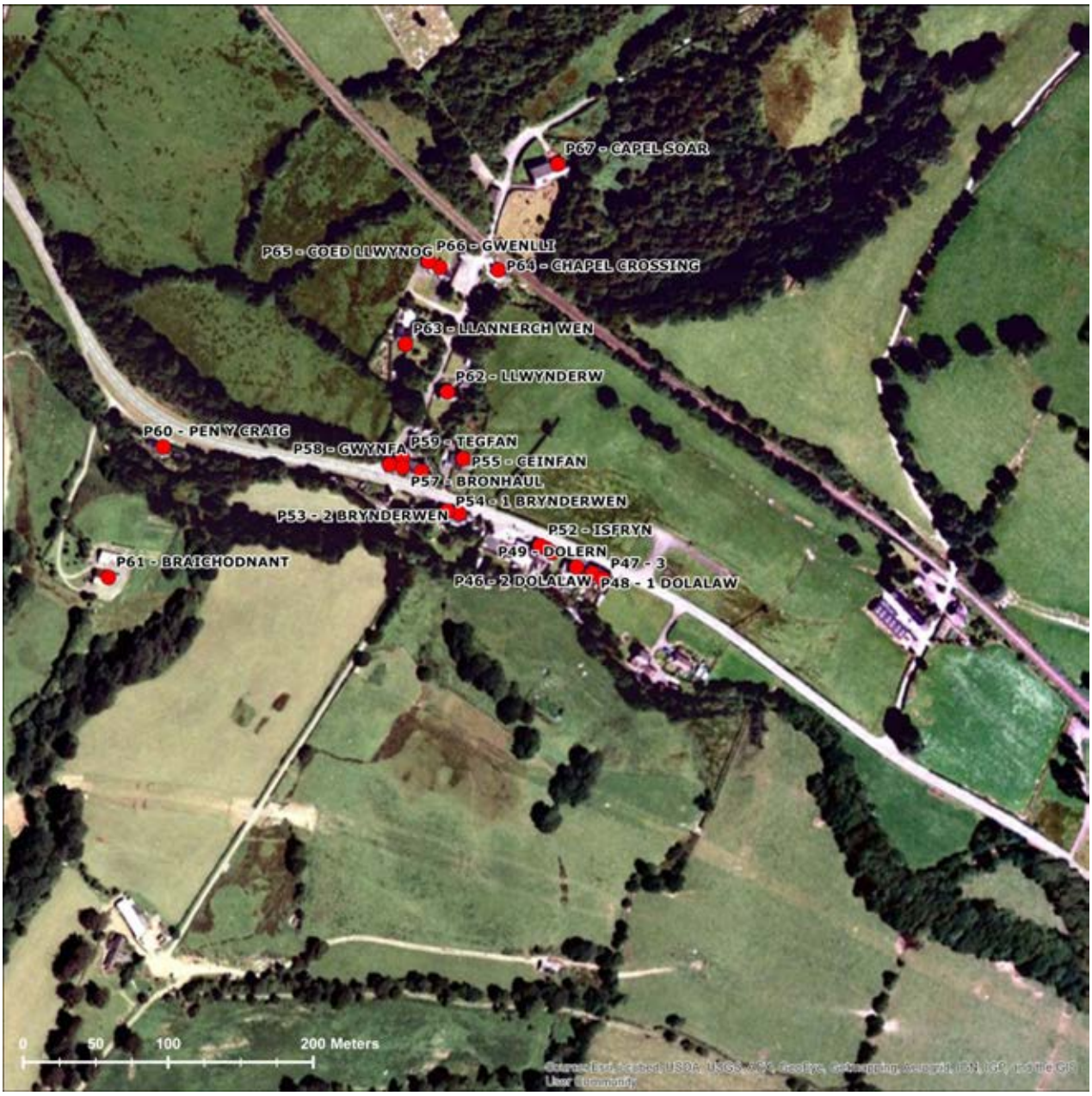
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P51 Maesteg		Appendix 4.1, Figure 33a-b
OS Grid Reference	291336	301695
Distance to nearest turbine (& turbine no.)	2263m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	4 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	18˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. Private gardens lie to the front of the property alongside the road and to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

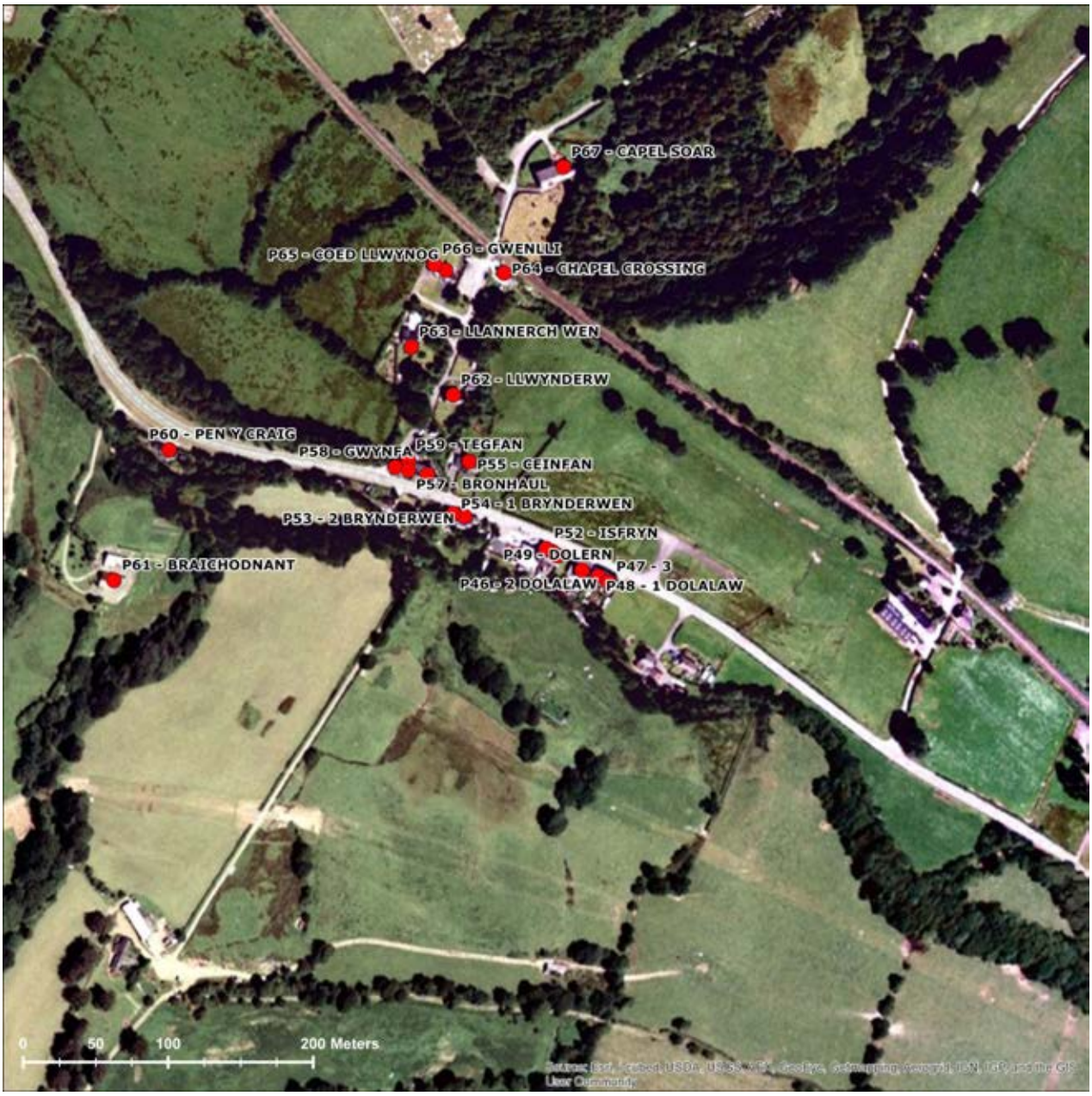
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P52 Isfryn		Appendix 4.1, Figure 34a-b
OS Grid Reference	291332	301697
Distance to nearest turbine (& turbine no.)	2264m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	6 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property

Two storey terraced property located alongside the A470 in Dolfach. Private gardens lie to the front of the property alongside the road and to the rear of the property leading down to the wooded Afon Laen river corridor. Pitched views towards the rounded hills atop the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470 opposite to the pasture fields with tree lined field boundaries and wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

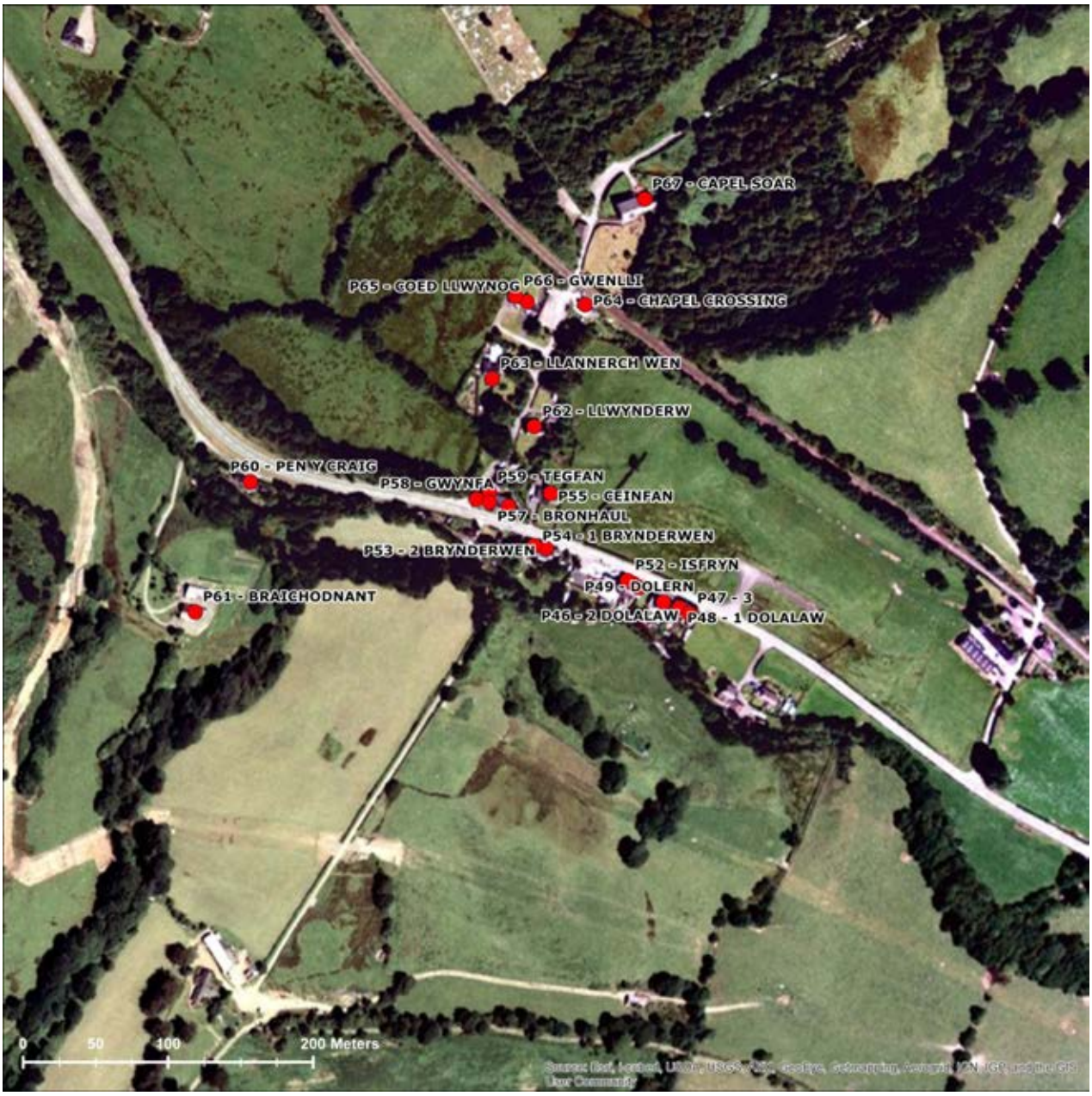
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P53 2 Brynderwen		Appendix 4.1, Figure 35a-b
OS Grid Reference	291276	301719
Distance to nearest turbine (& turbine no.)	2275m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. The front of the property lies alongside the road and deciduous trees and vegetation are located to the rear of the property, leading down to the Afon Laen river corridor. Pitched views towards the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470, to the wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

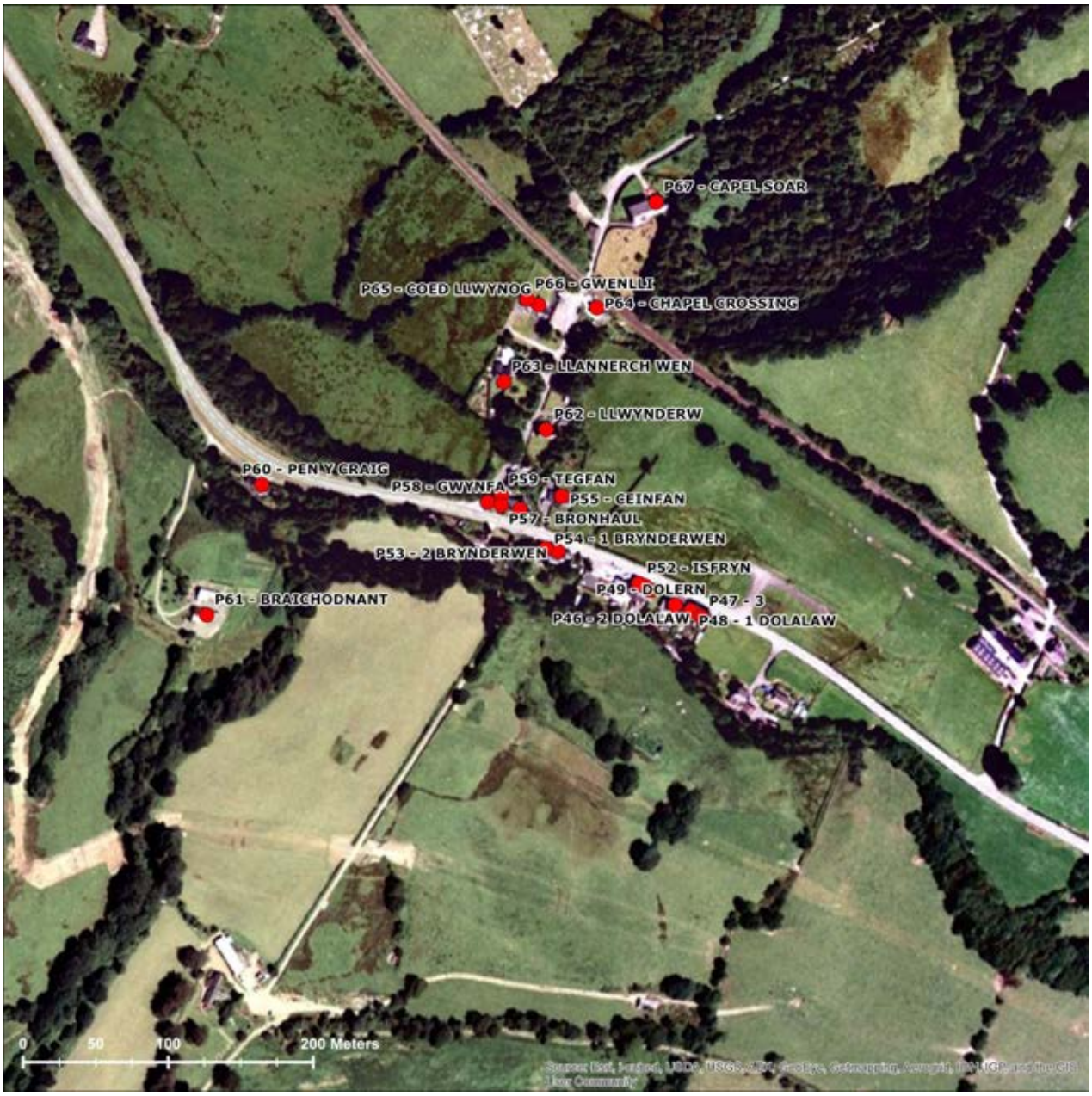
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P54 1 Brynderwen		Appendix 4.1, Figure 36a-b
OS Grid Reference	291268	301721
Distance to nearest turbine (& turbine no.)	2278m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. The front of the property lies alongside the road and deciduous trees and vegetation are located to the rear of the property, leading down to the Afon Laen river corridor. Pitched views towards the southern wooded slopes of the valley are available from the rear curtilage of the property with views available from the primary outlook of the property across the A470, to the wooded western slopes of Moel Caetwpa which form the skyline to the north-east.

Description of likely views of the Proposed Development from the property

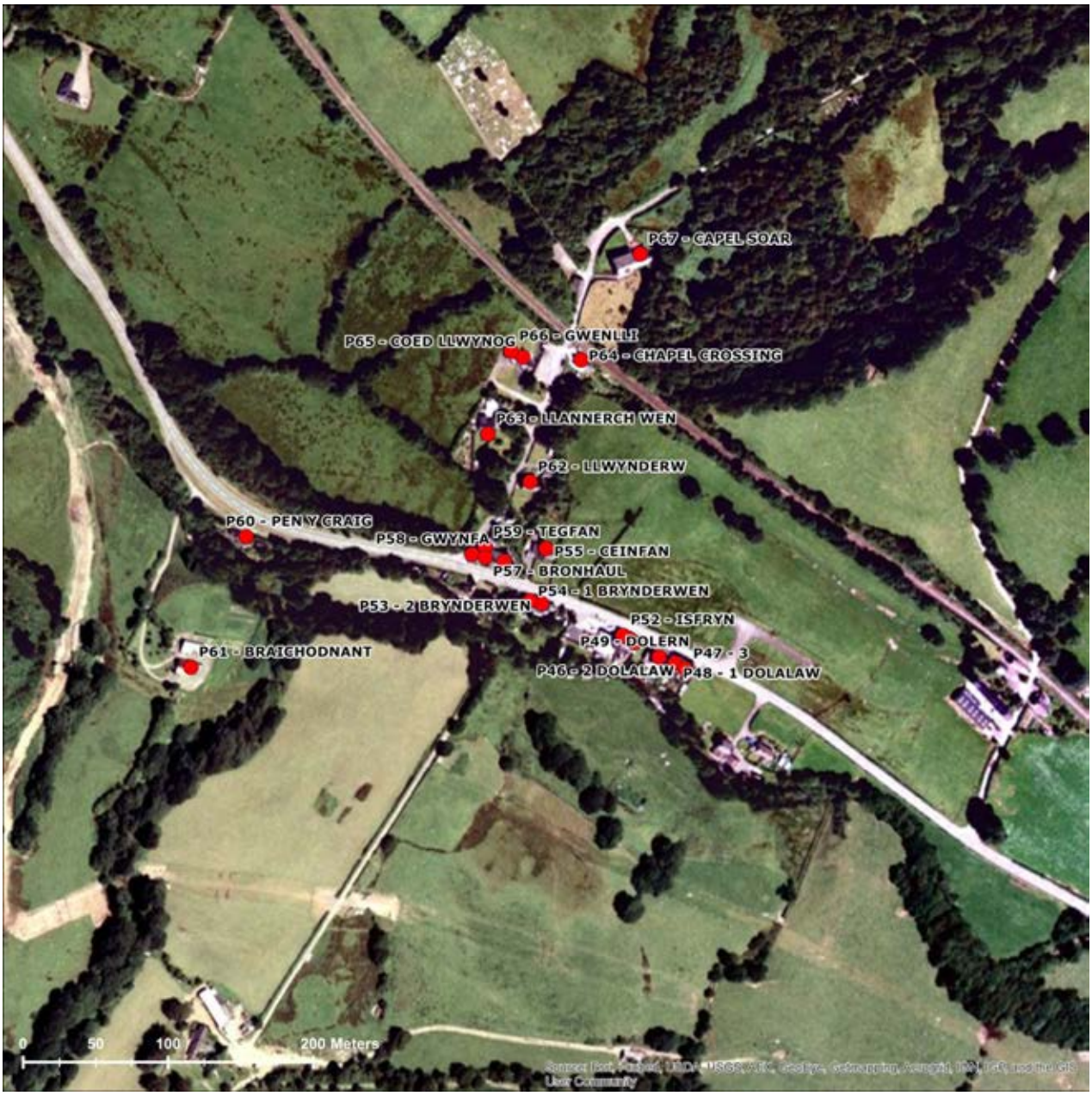
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P55 Ceinfan		Appendix 4.1, Figure 37a-b
OS Grid Reference	291279	301757
Distance to nearest turbine (& turbine no.)	2242m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	5 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey detached property located adjacent to the A470 at Dolfach. The property sits back from the road edge within private grounds bound by deciduous hedgerows and trees. The primary outlook of the property is south-west across the A470, to the steep wooded slopes on the south of the valley. Pitched views are possible north, north-east from the curtilage and rear of the property towards the wooded slopes of Moel Caetwpa and east along the valley.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous trees to the rear of the property and deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

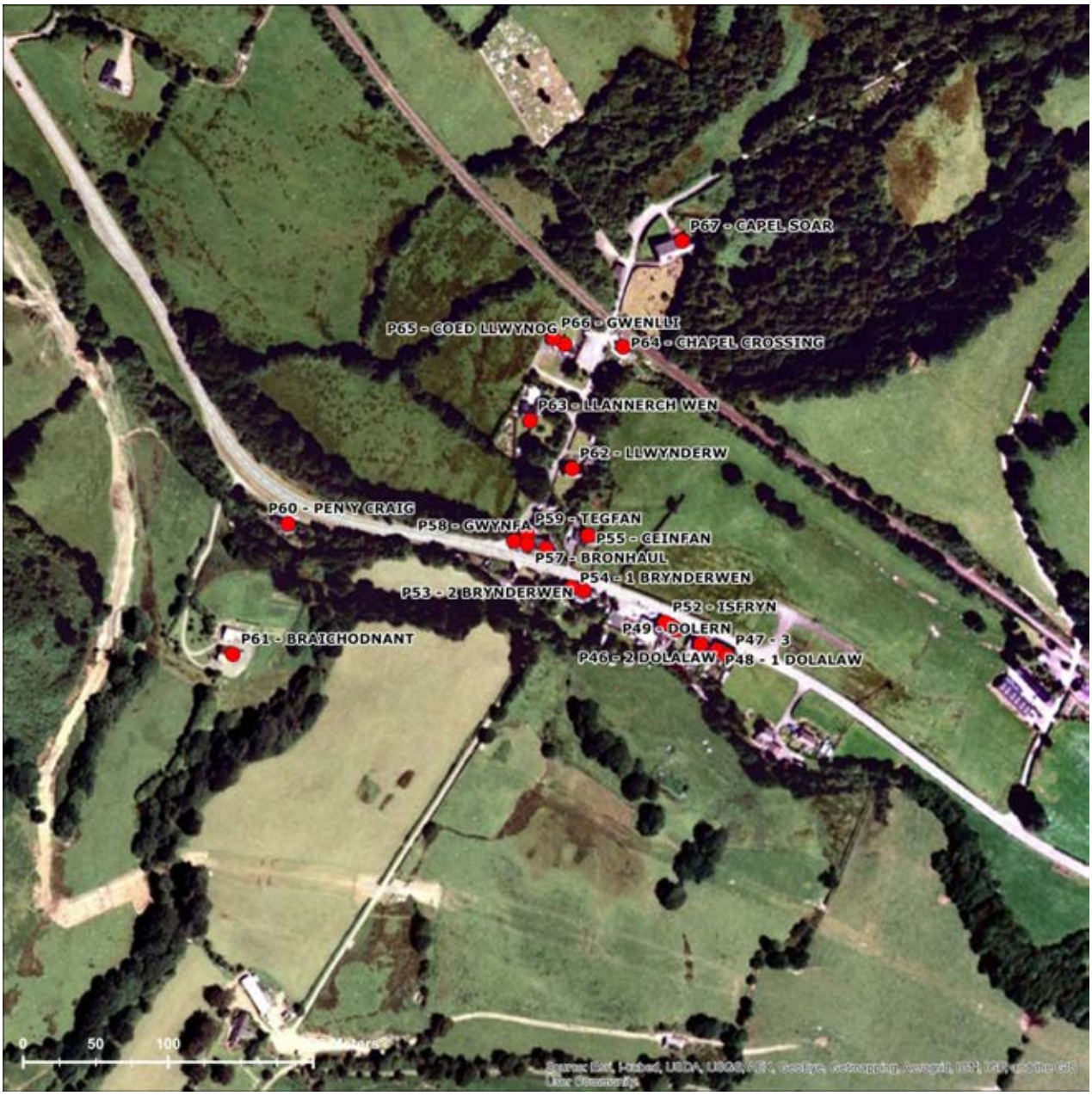
Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion

The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P56 Cartrefle		Appendix 4.1, Figure 38a-b
OS Grid Reference	291250	301748
Distance to nearest turbine (& turbine no.)	2265m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. A small private garden is located to the front of the property alongside the road with outbuildings and deciduous trees and vegetation located to the rear of the properties. Pitched views towards the southern wooded slopes of the valley are available from the primary outlook of the property; however views from the rear of the properties towards the Development Site to the north-east are contained by the presence of outbuildings, dense deciduous vegetation and trees, and adjacent residential properties.

Description of likely views of the Proposed Development from the property

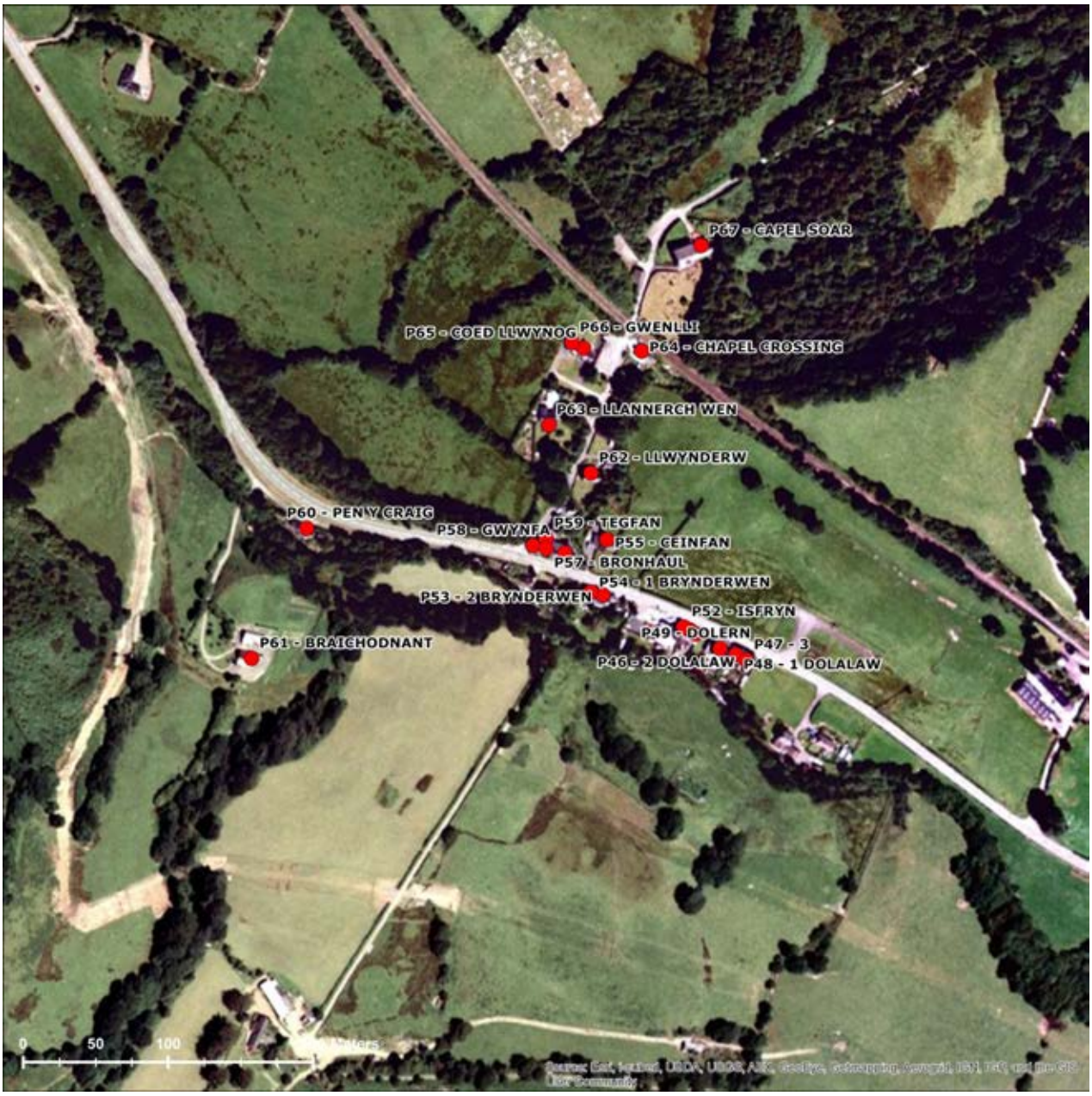
The Proposed Development would not be perceptible from this property due to the presence of deciduous trees to the rear of the property and deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P57 Bronhaul		Appendix 4.1, Figure 39a-b
OS Grid Reference	291237	301751
Distance to nearest turbine (& turbine no.)	2270m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19°	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. A small private garden is located to the front of the property alongside the road with outbuildings and deciduous trees and vegetation located to the rear of the properties. Pitched views towards the southern wooded slopes of the valley are available from the primary outlook of the property; however views from the rear of the properties towards the Development Site to the north-east are contained by the presence of outbuildings, dense deciduous vegetation and trees, and adjacent residential properties.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous trees to the rear of the property and deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P58 Gwynfa		Appendix 4.1, Figure 40a-b
OS Grid Reference	291228	301753
Distance to nearest turbine (& turbine no.)	2274m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. A small private garden is located to the front of the property alongside the road with outbuildings and deciduous trees and vegetation located to the rear of the properties. Pitched views towards the southern wooded slopes of the valley are available from the primary outlook of the property; however views from the rear of the properties towards the Development Site to the north-east are contained by the presence of outbuildings, dense deciduous vegetation and trees, and adjacent residential properties.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous trees to the rear of the property and deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P59 Tegfan		Appendix 4.1, Figure 41a-b
OS Grid Reference	291237	301758
Distance to nearest turbine (& turbine no.)	2265m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey terraced property located alongside the A470 in Dolfach. A small private garden is located to the front of the property alongside the road with outbuildings and deciduous trees and vegetation located to the rear of the properties. Pitched views towards the southern wooded slopes of the valley are available from the primary outlook of the property; however views from the rear of the properties towards the Development Site to the north-east are contained by the presence of outbuildings, dense deciduous vegetation and trees, and adjacent residential properties.

Description of likely views of the Proposed Development from the property

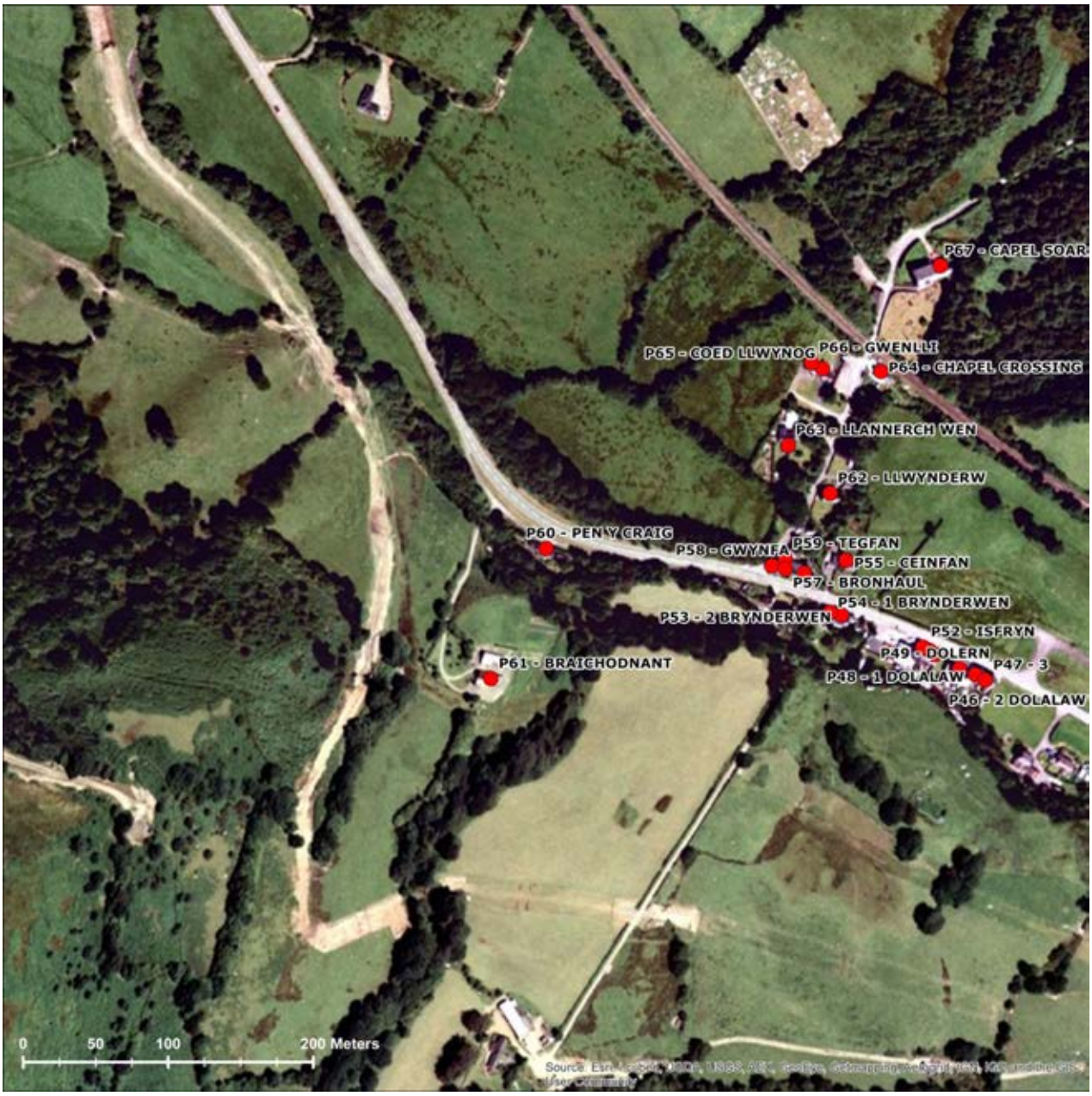
The Proposed Development would not be perceptible from this property due to the presence of deciduous trees to the rear of the property and deciduous woodland which forms the middle ground covering the western slopes of Moel Caetwpa to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P60 Pen Y Craig		Appendix 4.1, Figure 42a-b
OS Grid Reference	291072	301765
Distance to nearest turbine (& turbine no.)	2357m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	6 Tips
Primary Outlook/ Orientation of Property	North, north-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	



Description of property and existing views

Two storey property located alongside the A470 at the foot of the Afon Laen river valley. The property and curtilage is enclosed by deciduous woodland to the south, west and east, and deciduous woodland atop the steep road cutting located on the opposite side of the A470. Views from the primary outlook of the property are north-east across the A470 to the dense deciduous woodland and vegetation opposite. Due to the low lying position of the property, views outwith the curtilage are limited to pitched views to the steep slopes of the valley sides, extensively screened by the dense woodland which surrounds the property.

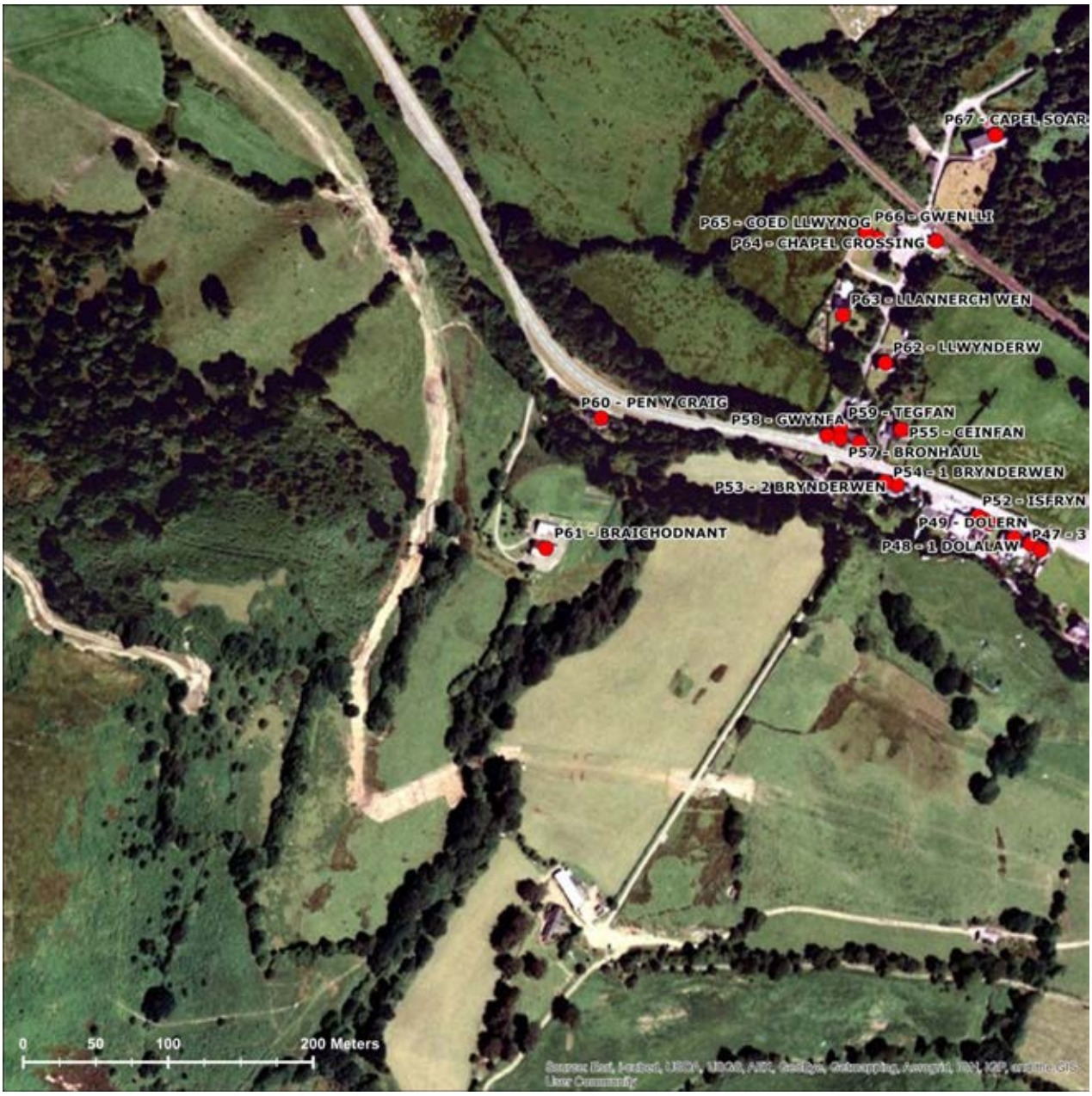
Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the low lying position of the property within the valley and the presence of deciduous woodland in the foreground and middle distance to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P61 Braichodnant		Appendix 4.1, Figure 43a-b
OS Grid Reference	291034	301675
Distance to nearest turbine (& turbine no.)	2451m	R32
Potential No. of turbines visible (hubs & tips)	3 Hubs	8 Tips
Primary Outlook/ Orientation of Property	North, north-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	18˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	1˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	20˚	



Description of property and existing views

Two storey property located in an elevated position on the southern mid-slopes the Afon Laen river valley. The property is accessed via a steep private access track from the north, with outbuildings lying directly south of the property, and deciduous trees and vegetation forming the boundary of the curtilage to the south, east and west. The property has a large conservatory located on the eastern gable of the property and an outdoor hot tub located to the front of the property. The primary outlook of the property offers views north-east towards the Development Site with the high ground of Banc y Gorlan forming the skyline between the two distinctive hills which form the Nant y Capel valley.

Description of likely views of the Proposed Development from the property

Approximately five turbines of the Proposed Development would be visible to the north-east of the property, appearing across a proportion of the skyline above Banc y Gorlan. Turbines would be visible from the primary outlook of the property appearing between the two distinctive hills which form the Nant y Capel valley opposite the property and beyond the deciduous woodland which forms the middle distance of the view. The turbines would be partially screened by the intervening topography, with visibility limited to turbine hubs and tips. This would result in a medium magnitude of change in views

from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
Carnedd Wen would be barely perceptible from this property, limited to potential visibility of one turbine blade tip appearing above the skyline of Banc y Gorlan to the north-east of the property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear larger and closer to the property, and the turbines of Carnedd Wen Wind Farm would be barely perceptible from this property. Where visible the turbines would appear as one wind farm from this property in views to the north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, conservatory, and the elevated private gardens and curtilage of the property, is considered to be medium. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would appear closer and larger than those of Carnedd Wen Wind Farm, is considered to be medium.

P62 Llwynderw		Appendix 4.1, Figure 44a-b
OS Grid Reference	291268	301803
Distance to nearest turbine (& turbine no.)	2210m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	5 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey property located adjacent to the minor road leading north from Dolfach and the A470, with private gardens and outbuildings located to the north and south of the property. The property is enclosed by deciduous trees to the east and south and dense deciduous trees and hedgerows to the west of the minor road surrounding the adjacent property. Pitched views towards the wooded slopes of Moel Caetwpa to the north-east and Newydd Fynyddog to the south are possible from the property and curtilage.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the foreground and middle distance to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion

The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P63 Llannerch Wen		Appendix 4.1, Figure 45a-b
OS Grid Reference	291239	301836
Distance to nearest turbine (& turbine no.)	2200m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	5 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	19˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views
Two storey property located adjacent to the minor road leading north from Dolfach and the A470, and enclosed by dense deciduous hedgerows and trees to the east, north and south. The property is accessed by a short private driveway from the east, with enclosed private gardens located to the west and south of the property. The property affords views west, north-west along the valley, and pitched views to the steep wooded slopes on the south side of the valley, however views north-east towards the Development Site are contained by the presence of deciduous woodland.
Description of likely views of the Proposed Development from the property
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the foreground and middle distance to the north-east for the property. This would result in a barely perceptible magnitude of change in views from this property and adjacent properties to the north.
Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen would not be visible from this property.

Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P64 Chapel Crossing		Appendix 4.1, Figure 46a-b
OS Grid Reference	291303	301887
Distance to nearest turbine (& turbine no.)	2121m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	5 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	20˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views
Single storey property located adjacent to the former crossing over the railway line which runs along the valley. The property is enclosed by deciduous trees and outbuildings to the south and deciduous woodland to the east, northeast beyond the railway line. Views from the curtilage of the property are possible along the valley to the north-west and pitched views across the valley to the higher ground of Newydd Fynyddog are possible from the curtilage and primary outlook of the property, partially screened by the presence of deciduous trees.
Description of likely views of the Proposed Development from the property
The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance to the north-east. This would result in a barely perceptible magnitude of change in views from this property.
Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P65 Coed Llwynog		Appendix 4.1, Figure 47a-b
OS Grid Reference	291263	301889
Distance to nearest turbine (& turbine no.)	2143m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	5 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	20˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey semi-detached property located to the south of the railway line. The property has private gardens to the rear and front of the property enclosed by fencing deciduous vegetation to the rear of the property alongside the railway line. A conservatory is located to the rear of the property. The property affords views north-west along the river valley however views south, south-east are contained by deciduous trees located to the south and east of the property. Pitched views towards the steep slopes on the south of the valley are possible from the primary outlook and curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance to the north-east. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion

The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P66 Gwenlli		Appendix 4.1, Figure 48a-b
OS Grid Reference	291255	301893
Distance to nearest turbine (& turbine no.)	2144m	R32
Potential No. of turbines visible (hubs & tips)	1 Hub	5 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	20˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey semi-detached property located to the south of the railway line. The property has private gardens to the rear and front of the property enclosed by fencing deciduous vegetation to the rear of the property alongside the railway line. The property affords views north-west along the river valley however views south, south-east are contained by deciduous trees and the adjacent property located to the south and east of the property respectively. Pitched views towards the steep slopes on the south of the valley are possible from the primary outlook and curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance to the north-east. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion

The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P67 Capel Soar		Appendix 4.1, Figure 49a-b
OS Grid Reference	291344	301960
Distance to nearest turbine (& turbine no.)	2038m	R32
Potential No. of turbines visible (hubs & tips)	2 Hubs	5 Tips
Primary Outlook/ Orientation of Property	North-west, south-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	20˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Two storey property located in an elevated position on the northern edge of Dolfach, above the Afon Laen river valley. The property is enclosed by deciduous woodland to the east and north which contain views in these directions. Private gardens located to the south and west of the property afford views south and west across and along the river valley respectively. Pitched views up the steep southern slopes of the valley are possible from the primary outlook and curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the foreground and middle distance to the north-east. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.

Conclusion

The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible.

P68 Cwm Carnedd Isaf		Appendix 4.1, Figure 50a-b
OS Grid Reference	291814	302644
Distance to nearest turbine (& turbine no.)	1208m	R32
Potential No. of turbines visible (hubs & tips)	0 Hubs	2 Tips
Primary Outlook/ Orientation of Property	North-west, south-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	15˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views

Single storey property which lies at the head of the deciduous tree lined narrow valley of Nant y Capel, north of Dolfach and is accessed by minor road and private access track from the south. The property is enclosed by Deciduous woodland directly to the east, south and west of the curtilage. Deciduous woodland also lies to the north of the property and screens views towards the Development Site. However pitched views to the skyline atop the surrounding steep valley sides are available from the front (north-west) of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be barely perceptible from this property, with visibility limited to a small proportion of turbine blades appearing above the skyline formed by Banc y Gorlan to the north-east of the property. The presence of deciduous woodland to the north of the property and along the access track to the west, would also contain any potential visibility of turbines when approaching the property. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, access track and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible/none.

P69 Cwm Carnedd Uchaf		Appendix 4.1, Figure 51a-b
OS Grid Reference	291580	302870
Distance to nearest turbine (& turbine no.)	1206m	R32
Potential No. of turbines visible (hubs & tips)	0 Hubs	2 Tips
Primary Outlook/ Orientation of Property	East, south-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	21°	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	n/a	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	n/a	

Description of property and existing views[33]

This two storey farmhouse lies at the head of the deciduous tree lined narrow valley of Nant y Capel, north of Dolfach and is accessed by a long private farm track from the south. Large agricultural buildings are located to the north and contain views to the north, north-east from the property and surrounding curtilage. Deciduous woodland and coniferous hedgerows contain views outwith the curtilage of the property, however pitched views to the skyline atop the surrounding steep valley sides are available in all directions from the curtilage of the property.

Description of likely views of the Proposed Development from the property

Two turbine blades tips of the Proposed Development would potentially be perceptible from this property appearing above a small proportion of the skyline formed by Banc y Gorlan to the north-east of the property. The presence of intervening agricultural buildings located to the north of the property, limit these views to areas of the surrounding curtilage and views from the access track when approaching the property. This would result in a low magnitude of change in views from this property.

[33] Property financially involved in the Llanbrynmair Wind Farm Development

Description of likely views of Carnedd Wen Wind Farm from the property
The turbines of Carnedd Wen would not be visible from this property.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, access track and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover and coniferous hedgerows, is considered to be low.

P86 Wynnstay Farm		Appendix 4.1, Figure 52a-b
OS Grid Reference	290185	303009
Distance to nearest turbine (& turbine no.)	2348m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	North-west, south/east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	23˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	46˚	

Description of property and existing views

Two storey property located in an elevated position adjacent to the railway line which forms the northern boundary of the settlement of Llanbrynmair. The property affords views north, north-west along the valley towards the hamlet of Pandy and pitched views available north-east towards the ridge formed by Cerrig y Tân from the curtilage of the property. Deciduous woodland lining the railway line contains views south and field boundary trees contain long distance views to the east.

Description of likely views of the Proposed Development from the property

The Proposed Development would be largely imperceptible from this property due to the presence of deciduous woodland in the middle distance. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

Approximately three turbines of Carnedd Wen would potentially be perceptible above the ridgeline of Cerrig y Tân to the north-east of the property. The presence of intervening deciduous woodland and field boundary trees, and coniferous forestry would limit visibility of these turbines to such an extent

that they would be barely perceptible from the property and curtilage.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would be barely perceptible from this property. Where visible the turbines would appear as one wind farm from this property in views to the north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, access track and the private gardens and curtilage of the property, along with the screening presence of intervening deciduous tree cover, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would be barely visible, is considered to be barely perceptible/none.

P87 Soar		Appendix 4.1, Figure 53a-b
OS Grid Reference	290003	303052
Distance to nearest turbine (& turbine no.)	2499m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	East, south-east	
Direction of Views to Proposed Development	North-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	35˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	47˚	

Description of property and existing views

Two storey property located alongside Pandy Road to the north of the railway line which forms the northern boundary of the settlement of Llanbrynmair. Private gardens lie to the north, east and west of the property, contained by deciduous trees to the west and south. The property affords views east across enclosed pasture fields to the east of the road, rising up to the ridge formed by Cerrig y Tân to the north-east, from the primary outlook and curtilage of the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would be largely imperceptible from this property due to the presence of deciduous woodland in the middle distance. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

A small number of turbines of Carnedd Wen would potentially be perceptible above the ridgeline of Cerrig y Tân to the north-east of the property. The presence of intervening deciduous woodland and field boundary trees, and coniferous forestry would limit visibility of these turbines to such an extent

that they would be barely perceptible from the property and curtilage.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would be barely perceptible from this property. Where visible the turbines would appear as one wind farm from this property in views to the north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, access track and the private gardens and curtilage of the property, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where the turbines of the Proposed Development would be barely visible, is considered to be barely perceptible/none.

P94 Brynaere Uchaf		Appendix 4.1, Figure 54a-c
OS Grid Reference	289858	304093
Distance to nearest turbine (& turbine no.)	2470m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	5 Tips
Primary Outlook/ Orientation of Property	North-east	
Direction of Views to Proposed Development	East, north-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	25˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	51˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	73˚	

Description of property and existing views

Two storey farmhouse located in an elevated position on the upper western slopes of the Afon Rhiwsason river valley. Agricultural buildings and hardstanding lie to the south, south-west and contain views in these directions from the property and curtilage. Deciduous trees and hedgerows line the boundary of the curtilage to the north, east and west of the property and screen long distance views towards the Development Site from the ground level of the property.

Description of likely views of the Proposed Development from the property

Five turbines would be visible perceptible from this property, appearing as blade tips above the ridge formed by the high ground of Cerrig y Tân on the east of the valley and occupying a small proportion of the available view. Due to the presence of deciduous vegetation in the foreground and coniferous forestry located beyond the distant skyline, turbines would be barely perceptible from this property and the surrounding curtilage. This would result in a low magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

Approximately ten turbines of Carnedd Wen would potentially be visible from this property, appearing

across a large proportion of the available view towards the skyline formed by Cerrig y Tân on the east of the valley. Potential visibility would be reduced by the presence of deciduous vegetation in the foreground and coniferous forestry located beyond the distant skyline.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would appear alongside those of Carnedd Wind Farm in views from this property, however visibility of turbines would be limited to views of blade tips, and the two developments would appear as one wind farm from this property in views to the east, north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, access track and the private gardens and curtilage of the property, is considered to be barely perceptible. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible.

P103 Bodhyfryd		Appendix 4.1, Figure 55a-b
OS Grid Reference	290360	304663
Distance to nearest turbine (& turbine no.)	2082m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	North-west, south-east	
Direction of Views to Proposed Development	East, northeast	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	2˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	41˚	

Description of property and existing views

Two storey semi-detached property located alongside the minor road through the Afon Rhiwsaeson river valley and affords north-west views along the valley from the primary outlook, with private gardens located to the south and access track to the north of the property. Hedgerows and vegetation mark the boundary of the curtilage to the south and east and views eastwards towards the Development Site are contained by the adjacent property and gardens to the east. Existing views towards the higher ground of the Development Site are however possible from the front curtilage and access to the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The blade tip of one turbine of Carnedd Wen would potentially be visible from this property, however this visibility is likely to be screened by the presence of coniferous forestry across the skyline of Cors

Fforchig to the east.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development and Carnedd Wen Wind Farm would be barely perceptible from this property. Where visible the blade tips of turbines would appear as one wind farm from this property in views to the east, north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage of the property, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

P104 Llwyngwern		Appendix 4.1, Figure 56a-b
OS Grid Reference	290355	304660
Distance to nearest turbine (& turbine no.)	2085m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	North-west, south-east	
Direction of Views to Proposed Development	East, northeast	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	2˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	41˚	

Description of property and existing views

Two storey semi-detached property located alongside the minor road through the Afon Rhiwsaeson river valley and affords north-west views along the valley from the primary outlook, with private gardens located to the south and access track to the north of the property. Hedgerows and vegetation mark the boundary of the curtilage to the south and east and contain views eastwards towards the Development Site. Existing views towards the higher ground of the Development Site are however possible from the front curtilage and access to the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance and coniferous forestry located on the skyline beyond. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The blade tip of one turbine of Carnedd Wen would potentially be visible from this property, however this visibility is likely to be screened by the presence of coniferous forestry across the skyline of Cors

Fforchig to the east.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development and Carnedd Wen Wind Farm would be barely perceptible from this property. Where visible the blade tips of turbines would appear as one wind farm from this property in views to the east, north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage of the property, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

P105 Rhiwsaesin Mill		Appendix 4.1, Figure 57a-b
OS Grid Reference	290312	304656
Distance to nearest turbine (& turbine no.)	2125m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	North-west	
Direction of Views to Proposed Development	East, northeast	
Approximate angle of view potentially affected by turbines of the Proposed Development	1°	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	2°	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	41°	

Description of property and existing views

Two storey property located at the foot of the river valley, within the surrounding pasture fields. Orientated to afford views along the valley in north-west, southeast direction with pitched views to the wooded slopes of the valley to the east and west. Dense deciduous woodland located along the course of the river screens views outwith the valley. Existing views towards the higher ground of the Development Site are possible from the curtilage and access track to the east when leaving the property.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance and coniferous forestry located on the skyline beyond. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The blade tip of one turbine of Carnedd Wen would potentially be visible from this property, however this visibility is likely to be screened by the presence of coniferous forestry across the skyline of Cors Fforchig to the east.

Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development and Carnedd Wen Wind Farm would be barely perceptible from this property, and any additional change in view would be minimal. Where visible the blade tips of turbines would appear as one wind farm from this property in views to the east, north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage, and access track of the property, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

P106 Pencaedu		Appendix 4.1, Figure 58a-b
OS Grid Reference	290303	304897
Distance to nearest turbine (& turbine no.)	2222m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	North-west	
Direction of Views to Proposed Development	East, north-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	20˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	41˚	

Description of property and existing views

Two storey property located in a slightly elevated position above the low lying river valley north of Pandy. The property is accessed by a private driveway from the south and is contained by deciduous trees to the north, east and south of its curtilage, with primary views focused north-west along the river valley. Views towards the Development Site are screened by deciduous trees located along the eastern curtilage and coniferous forestry across the skyline in the distance.

Description of likely views of the Proposed Development from the property

The Proposed Development would not be perceptible from this property due to the presence of deciduous woodland in the middle distance and coniferous forestry located on the skyline beyond. This would result in a barely perceptible magnitude of change in views from this property.

Description of likely views of Carnedd Wen Wind Farm from the property

The blade tips of up to three turbines of Carnedd Wen would potentially be visible from this property, however these are likely to be screened by the presence of coniferous forestry across the skyline of Cors Fforchig to the east.

Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development and Carnedd Wen Wind Farm would be barely perceptible from this property, and any additional change in view would be minimal. Where visible the blade tips of turbines would appear as one wind farm from this property in views to the east, north-east.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage and access track to the property, and the screening presence of deciduous tree cover, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

P112 Rhydymeirch		Appendix 4.1, Figure 59a-f
OS Grid Reference	292084	306868
Distance to nearest turbine (& turbine no.)	2122m	R7
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	East, south-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	160˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	160˚	

Description of property and existing views

This two storey stone property occupies an elevated position to the west of the minor road, with the private gardens and access drive affording a south-easterly outlook across the valley. Deciduous woodland lines the valley to the east and contains views to the upper slopes of the valley and higher ground of the Development Site beyond.

Description of likely views of the Proposed Development from the property

The turbines of the proposed development would not be visible from this property with turbine blades on the distant skyline to the east screened by coniferous forestry, leading to a barely perceptible magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

The proposed turbines of Carnedd Wen would appear across the skyline to the east of the property occupying approximately 90˚of the available view.

Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property

The turbines of the Proposed Development would be barely perceptible from this property alongside the turbines of Carnedd Wen Wind Farm, which would occupy a large proportion of the skyline to the north-east, east and south-east of the property. Where visible in combination, the turbines of the two developments would appear as one wind farm.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage and access track to the property, and the screening presence of deciduous tree cover, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

P113 Clegyrnant		Appendix 4.1, Figure 60a-c
OS Grid Reference	292154	307624
Distance to nearest turbine (& turbine no.)	2334m	R19
Potential No. of turbines visible (hubs & tips)	0 Hubs	2 Tips
Primary Outlook/ Orientation of Property	South-west	
Direction of Views to Proposed Development	South-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	90˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	90˚	

Description of property and existing views

This two storey farmhouse lies at the foot of the valley, with the primary views focused south, south-west along the valley. Agricultural outbuildings and deciduous trees contain views east up the steep slopes of the valley and the coniferous forestry which covers the hills which lie in the middle distance towards the Development Site.

Description of likely views of the Proposed Development from the property

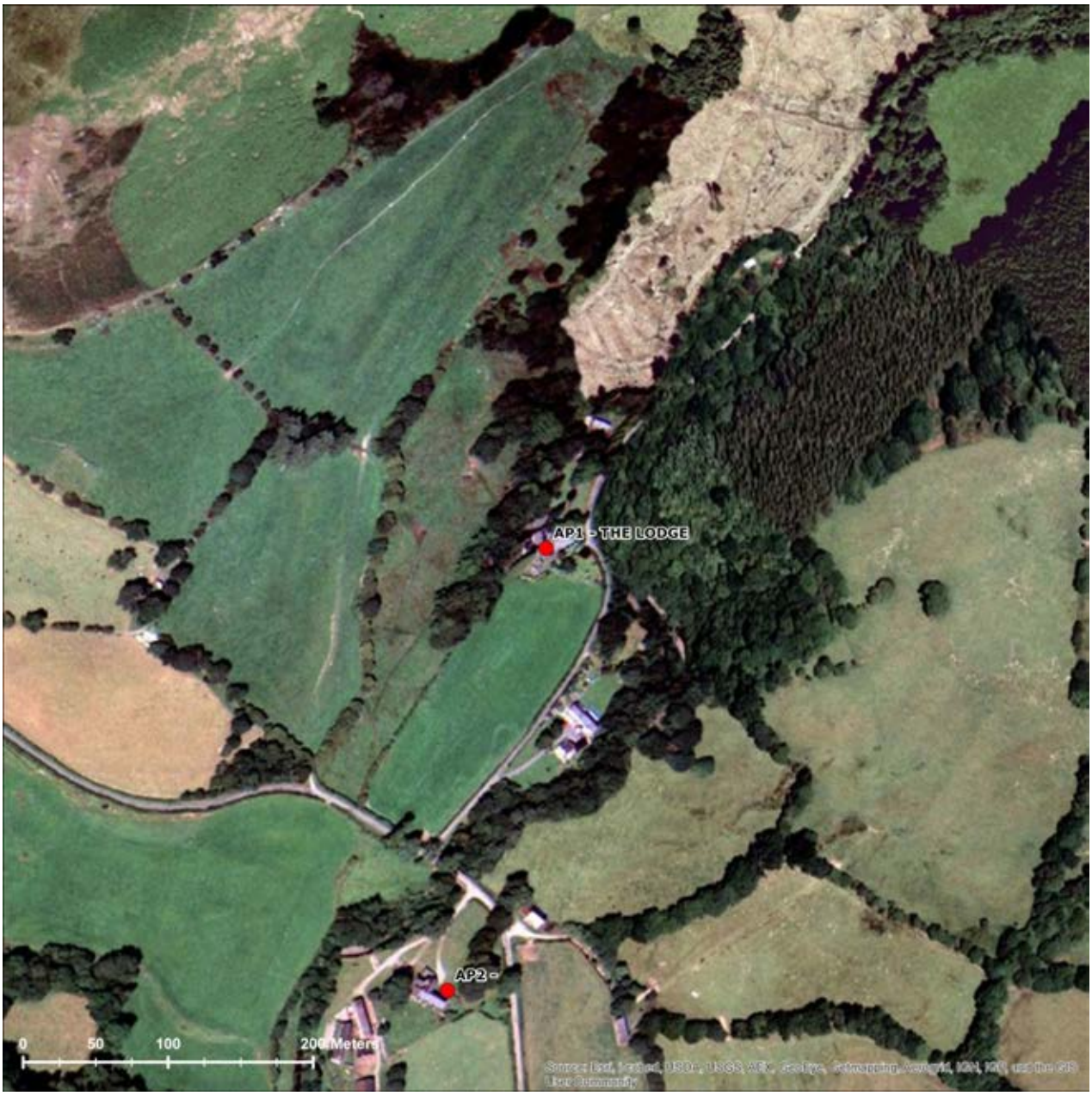
The turbines of the Proposed Development would not be perceptible from this property or the surrounding curtilage due to the presence of coniferous forestry located on the skyline formed by Panylau Gwynion. The property would therefore experience a barely perceptible magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

The proposed turbines of Carnedd Wen would be visible to the south-east from the curtilage of the property occupying a proportion of the skyline above the deciduous and coniferous woodland beyond Panylau Gwynion.

Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would not be perceptible from this property alongside the turbines of Carnedd Wen Wind Farm, which would occupy a proportion of the skyline to the south-east of the property. If in the event of future forestry felling the turbine blades of the Proposed Development become perceptible, the two developments would appear as one wind farm.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage and access track to the property, and the screening presence of steep local topography, coniferous forestry and deciduous tree cover, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

AP1 The Lodge		Appendix 4.1, Figure 61a-c
OS Grid Reference	290186	305441
Distance to nearest turbine (& turbine no.)	2594m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	North-east, east	
Direction of Views to Proposed Development	South-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	11˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	80˚	



Description of property and existing views

Two storey property located at the foot of the Clegyrnant river valley. The property sits within private grounds, enclosed by deciduous trees and hedgerows to the north, west and east, and affords views south across adjacent pasture fields from the primary outlook and curtilage of the property. Pitched views to the steep slopes and ridgelines of Mynydd Rhiw-Saeson and Ffridd Esgairgelynen are also possible from the curtilage of the property.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would not be perceptible from this property or the surrounding curtilage due to the presence of intervening topography and deciduous woodland located to the east of the property. The property would therefore experience a barely perceptible magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

The proposed turbines of Carnedd Wen would theoretically be visible in views along the Clegyrnant river valley to the north-east, with turbines appearing above the higher ground of Views are however likely to

be screened by deciduous woodland located directly east and north of the property and therefore the turbines would be barely perceptible from the property and curtilage.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would not be perceptible from this property alongside the turbines of Carnedd Wen Wind Farm, which would occupy a proportion of the skyline to the east, north-east of the property, and therefore there would be no additional cumulative change to views.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage and driveway of the property, and the screening presence of steep local topography and deciduous tree cover, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

AP2 Opposite P109		Appendix 4.1, Figure 62a-b
OS Grid Reference	290113	305132
Distance to nearest turbine (& turbine no.)	2496m	R31
Potential No. of turbines visible (hubs & tips)	0 Hubs	1 Tip
Primary Outlook/ Orientation of Property	South	
Direction of Views to Proposed Development	East, south-east	
Approximate angle of view potentially affected by turbines of the Proposed Development	1˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	25˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	42˚	

Description of property and existing views

Two storey property located alongside Pandy Rd. at the foot of the river valley of Clegyrnant, set within private grounds, with outbuildings located to the west and south-west and deciduous trees which line the eastern and southern boundary of the curtilage. Views east and north from the property are contained by the presence of deciduous trees and hedgerows located along the boundary of the curtilage. Views from the primary outlook of the property are focused south along the river valley towards the hamlet of Pandy. Pitched views are available from the curtilage of the property to the western slopes of the valley.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would not be perceptible from this property or the surrounding curtilage due to the presence of intervening topography and deciduous woodland located to the east of the property. The property would therefore experience a barely perceptible magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

Two turbines of Carnedd Wen Wind Farm may potentially be visible from the curtilage of this property, appearing as turbine blades above the distant ridgeline formed by the steep slopes of Ffridd Cwmyffynnon. However, turbines are likely to be screened by the presence of intervening deciduous woodland located in the middle distance of views to such an extent that they are barely perceptible in views from this property.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would not be perceptible from this property alongside the turbines of Carnedd Wen Wind Farm, which would occupy a small proportion of the skyline to the north of the property, and therefore there would be no additional cumulative change to views.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage and driveway of the property, and the screening presence of deciduous tree cover, is considered to be barely perceptible/none. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible/none.

AP4 Adjacent to P28 Pantglas		Appendix 4.1, Figure 63 a-c
OS Grid Reference	293161	300941
Distance to nearest turbine (& turbine no.)	2289m	R39
Potential No. of turbines visible (hubs & tips)	4Hubs	10 Tips
Primary Outlook/ Orientation of Property	East	
Direction of Views to Proposed Development	North	
Approximate angle of view potentially affected by turbines of the Proposed Development	28˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	20˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	28˚	

Description of property and existing views

Single storey barn conversion property located adjacent to Pantglas, with outbuildings located to the west of the property, and a farmyard to the south. Deciduous trees surround the adjacent property to the east and contain views east and south-east from the property. Views from the primary outlook are directly towards the adjacent property, however open views exist from the southern extent of the property and curtilage to the south-west across adjacent pasture fields. Views north towards the Development Site are contained by the presence of localised topography alongside the road opposite and the deciduous trees which sit atop this.

Description of likely views of the Proposed Development from the property

The turbines of the Proposed Development would not be perceptible from this property or the surrounding curtilage due to the presence of intervening topography, deciduous trees surrounding the property and the adjacent property to the east. The property would therefore experience a barely perceptible magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen Wind Farm are unlikely to be perceptible from this property due to the presence of intervening coniferous forestry, beyond the turbines of the Proposed Development in the middle distance.
Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property
The turbines of the Proposed Development would not be perceptible from this property alongside the turbines of Carnedd Wen Wind Farm, which would occupy a proportion of the skyline to the north of the property, and therefore there would be no additional cumulative change to views.
Conclusion
The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage of the property, and the screening presence of deciduous tree cover and the adjacent residential property, is considered to be barely perceptible. The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be barely perceptible.

AP6 Rhosperfeydd		**Appendix 4.1, Figure 64a-c**
OS Grid Reference	299061	310004
Distance to nearest turbine (& turbine no.)	2506m	R40
Potential No. of turbines visible (hubs & tips)	20 Hubs	24 Tips
Primary Outlook/ Orientation of Property	South-east	
Direction of Views to Proposed Development	South-west	
Approximate angle of view potentially affected by turbines of the Proposed Development	30˚	
Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	38˚	
Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	42˚	

Description of property and existing views

Single storey detached property located alongside the minor road north of Nant Nod wydd to the north-east of the Proposed Development. The property is enclosed by deciduous trees and vegetation to the east, south and west and several outbuildings are located to the south of the property. A sun room is located on the west gable of the property, however views south-west towards the Development Site are contained by the presence of deciduous hedgerows and trees. The curtilage of the property extends southwards towards the river valley below, and views south-west, possible from the curtilage of the property are partially screened by the presence of deciduous vegetation along the western boundary of the curtilage.

Description of likely views of the Proposed Development from the property

The proposed Development would be potentially visible from the property, appearing across a large proportion of the available view to the south-west, framed between the higher ground of Pen Coed to the left and Ffridd Goch to the right of the view. These would be limited to views from the curtilage of the property, and when approaching the property via the minor road from the north-east. Visibility of turbines from the primary outlook and sun room of the property would not be possible with potential

views contained by the presence of deciduous hedgerows and trees. The presence of deciduous trees and hedgerows located along field boundaries west of the property would also partially screen potential visibility of turbines and the property would therefore experience a low magnitude of change to views as a result of the Proposed Development.

Description of likely views of Carnedd Wen Wind Farm from the property

The turbines of Carnedd Wen would be visible to the south-west, from the curtilage of the property and when approaching the property on the minor road from the north-east. Turbines would appear across a large proportion of the available view, above the open moorland coniferous forestry which forms the distant skyline to the south-west, framed between the higher ground of Pen Coed to the left and Ffridd Goch to the right of the view. The turbines of both wind farms would be viewed as one development in combined views from this property.

Description of likely views of the Proposed Development and Carnedd Wen Wind Farm from the residential property

The additional turbines of the Proposed Development would increase the density of turbines visible to the south-west of the property, appearing alongside the turbines of Carnedd Wen Wind Farm. The Proposed Development would extend the spread of turbines across the view between Pen Coed and Ffridd Goch, however the turbines of the two developments would appear at a similar scale and perceptually appear as one wind farm in views from the approach and curtilage of this property.

Conclusion

The magnitude of change to the visual amenity of this property, taking into account views from the primary outlook, private gardens and curtilage of the property, and the screening presence of deciduous tree cover, is considered to be medium.

The magnitude of cumulative change to the visual amenity of this property, where visibility of turbines of the Proposed Development would be limited, is considered to be low.

1.7 Study Findings and Conclusions

1.7.1 The study findings of changes in views and residential visual amenity and the visual component of living condtions are summarised in **Appendix Table 4.2** below and outlined in detail in **Appendix Table 4.3** which follows.

Appendix Table 4.2: Summary of Findings

ID	Property Name	Magnitude of Change to Views and Visual Amenity	Magnitude of Cumulative Change to Views and Visual Amenity	Property included in detailed assessment of Effects on Living Conditions
P8	Ysgubor Cannon	High	High	✓
P9	Cannon	High	High	✓
P13	Abercannon	High	High	✓
P19	Cwm Derwen	High	High	✓
P20	Delfryn	High	High	✓
P21	Ffriddfawr	High	High	✓
P22	Castell Y Gwynt	High	Medium	✓
P25	Capel Yr Aber	High	n/a	✓

Potential Changes in Views and visual Amenity

1.7.2 The assessment illustrates that some residential properties included in the assessmen have views limited by orientation of outlook, topography or screening provided by vegetation, built form or localised landscape features resulting in negligible or minor changes in view. Other residential properties have more open views towards a proportion of the Proposed Development or close views of the Proposed Development from non-primary outlooks resulting in medium magnitude of change to views and visual amenity. Eight residential properties of the 63 assessed would have views of a large proportion of the Proposed Development from their primary outlook or curtilage, resulting in a high magnitude of change to views and visual amenity.

Potential Cumulative Changes in Views and visual Amenity

1.7.3 Of the 63 properties included within the assessment, a judgement of the potential cumulative change to views and visual amenity as a result of introducing the Proposed Development to a baseline which already contained Carnedd Wen Wind Farm. 26 properties were identified for consideration, informed by the CZTV and wireframe visualisations and six properties were judged to demonstrate a high magnitude of cumulative change.

Potential Effects on Visual Component of Living Conditions

1.7.4 For each of the eight properties where a high magnitude of visual change was identified, an assessment of the changes in visual amenity 'in the round' was undertaken. This considered the potential effects on the visual component of 'living conditions', and it was found that when considering the changes in visual amenity 'in the round', the turbines of the proposed Llanbrynmair Wind Farm, if present in isolation or alongside the proposed turbines of Carnedd Wen Wind Farm, would not appear dominant, oppressive or overwhelming such that the properties would become unattractive places to live.

1.7.5 These judgements should in turn be considered by the Inspector and by planners as part of the wider planning judgement with respect to 'residential amenity'.

Appendix Table 4.3: Detailed Summary of Residential Visual Amenity Assessment

ID	Property Name	OS Grid Reference		Distance from nearest turbine of Proposed Development (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Approximate angle of view potentially affected by turbines of the Proposed Development	Magnitude of Change to Views and Visual Amenity	Theoretical Visibility of Carnedd Wen predicted by CZTV	Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	Magnitude of Cumulative Change to Views and Visual Amenity	Property included in detailed assessment of Effects on Living Conditions
		X	Y											
P1	Pen Yr Eisteddfod	297941	310870	2252m	R40	Yes	1 Hub/3 Tips	9˚	Barely perceptible	Yes	26˚	27˚	Barely perceptible	
P2	Caecrwn	298046	310849	2290m	R40	Yes	1 Hub/3 Tips	10˚	Barely perceptible	Yes	52˚	54˚	Barely perceptible	
P4	Llety Bach	298827	310247	2424m	R40	Yes	16 Hubs/20 Tips	13˚	Low	Yes	35˚	43˚	Low	
P5	Llety Mawr	298836	310271	2445m	R40	Yes	16 Hubs/18 Tips	13˚	Low	Yes	35˚	43˚	Low	
P6	Ffridd Newydd	298529	309887	1984m	R40	Yes	24 Hubs/29 Tips	37˚	Medium	Yes	40˚	49˚	Low	
P7	Bryn Du	298655	309689	2013m	R40	Yes	11 Hubs/16 Tips	155˚	Low	Yes	80˚	155˚	Low	
P8	Ysgubor Cannon	295943	307427	864m	R17	Yes	10 Hubs/15 Tips	155˚	High	Yes	85˚	155˚	High	✓
P9	Cannon	295885	307418	811m	R17	Yes	10 Hubs/17 Tips	155˚	High	Yes	85˚	155˚	High	✓
P10	Dolwen Uchaf	297495	307619	1087m	R43	Yes	12 Hubs/25 Tips	100˚	Medium	Yes	95˚	120˚	Medium	
P11	Dolwen Isaf	297531	307558	1157m	R43	Yes	25 Hubs/28 Tips	100˚	Medium	Yes	95˚	120˚	Medium	
P12	Moelddolwen	299212	307781	2491m	R43	Yes	2 Hubs/4 Tips	6˚	Barely perceptible	None	n/a	n/a	n/a	
P13	Abercannon	296276	306932	1011m	R42	Yes	17 Hubs/19 Tips	155˚	High	Yes	140˚	155˚	High	✓
P14	Hafod Y Beudy	298907	307166	2462m	R43	Yes	6 Hubs/6 Tips	15˚	Low	Yes	30˚	30˚	Low	
P15	Neint Hirion	296389	306603	1050m	R42	Yes	16 Hubs/19 Tips	150˚	Medium	Yes	140˚	150˚	Medium	
P16	Beulah Chapel House	296392	306656	1057m	R42	Yes	17 Hubs/19 Tips	150˚	Medium	Yes	110˚	150˚	Medium	
P17	Dolau	297043	306755	1715m	R42	Yes	23 Hubs/27 Tips	140˚	Medium	Yes	110˚	145˚	Medium	
P18	Dolau Ceimion	296395	305841	1272m	R42	Yes	26 Hubs/29 Tips	150˚	Low	Yes	110˚	150˚	Low	
P19	Cwm Derwen	295551	305393	887m	R23	Yes	11 Hubs/22 Tips	160˚	High	Yes	110˚	160˚	High	✓
P20	Delfryn	295711	305449	986m	R24	Yes	13 Hubs/25 Tips	160˚	High	Yes	110˚	160˚	High	✓
P21	Ffriddfawr	294686	303975	926m	R9	Yes	21 Hubs/30 Tips	155˚	High	Yes	85˚	155˚	High	✓
P22	Castell Y Gwynt	294882	302964	1360m	R39	Yes	30 Hubs/30 Tips	100˚	High	Yes	70˚	100˚	Medium	✓

ID	Property Name	OS Grid Reference		Distance from nearest turbine of Proposed Development (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Approximate angle of view potentially affected by turbines of the Proposed Development	Magnitude of Change to Views and Visual Amenity	Theoretical Visibility of Carnedd Wen predicted by CZTV	Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	Magnitude of Cumulative Change to Views and Visual Amenity	Property included in detailed assessment of Effects on Living Conditions
		X	Y											
P23	Pant Y Powsi	294814	302372	1517m	R39	Yes	0 Hubs/6 Tips	26˚	Low	None	n/a	n/a	n/a	
P25	Capel Yr Aber	293960	301839	1422m	R39	Yes	0 Hubs/0 Tips	n/a	High	None	n/a	n/a	n/a	✓
P26	Cwm Bach	293868	301056	2167m	R39	Yes	9 Hubs/13 Tips	35˚	Low	Yes	23˚	35˚	Low	
P28	Pant Glas	293171	300944	2284m	R39	Yes	4 Hubs/10 Tips	28˚	Low	Yes	20˚	28˚	Low	
P32	Cefn	292551	302071	1501m	R39	Yes	17 Hubs/22 Tips	51˚	Low	None	26˚	51˚	Low	
P46	2 Dolalaw	291375	301674	2261m	R32	Yes	0 Hubs/2 Tips	9˚	Barely perceptible	None	n/a	n/a	n/a	
P47	3 Dolfach	291375	301674	2261m	R32	Yes	0 Hubs/2 Tips	9˚	Barely perceptible	None	n/a	n/a	n/a	
P48	1 Dolalaw	291368	301678	2261m	R32	Yes	0 Hubs/3 Tips	9˚	Barely perceptible	None	n/a	n/a	n/a	
P49	Dolern	291357	301682	2263m	R32	Yes	1 Hub/3 Tips	10˚	Barely perceptible	None	n/a	n/a	n/a	
P50	Brynmair	291340	301692	2264m	R32	Yes	1 Hub/4 Tips	10˚	Barely perceptible	None	n/a	n/a	n/a	
P51	Maesteg	291336	301695	2263m	R32	Yes	1 Hub/4 Tips	18˚	Barely perceptible	None	n/a	n/a	n/a	
P52	Isfryn	291332	301697	2264m	R32	Yes	1 Hub/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P53	2 Brynderwen	291276	301719	2275m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P54	1 Brynderwen	291268	301721	2278m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P55	Ceinfan	291279	301757	2242m	R32	Yes	2 Hubs/5 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P56	Cartrefle	291250	301748	2265m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P57	Bronhaul	291237	301751	2270m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P58	Gwynfa	291228	301753	2274m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P59	Tegfan	291237	301758	2265m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P60	Pen Y Craig	291072	301765	2357m	R32	Yes	2 Hubs/6 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P61	Braichodnant	291034	301675	2451m	R32	Yes	3 Hubs/8 Tips	18˚	Medium	Yes	1˚	20˚	Medium	
P62	Llwynderw	291268	301803	2210m	R32	Yes	2 Hubs/5 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	
P63	Llannerch Wen	291239	301836	2200m	R32	Yes	2 Hubs/5 Tips	19˚	Barely perceptible	None	n/a	n/a	n/a	

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		X	Y											
P64	Chapel Crossing	291303	301887	2121m	R32	Yes	1 Hub/5 Tips	20˚	Barely perceptible	None	n/a	n/a	n/a	
P65	Coed Llwynog	291263	301889	2143m	R32	Yes	1 Hub/5 Tips	20˚	Barely perceptible	None	n/a	n/a	n/a	
P66	Gwenlli	291255	301893	2144m	R32	Yes	1 Hub/5 Tips	20˚	Barely perceptible	None	n/a	n/a	n/a	
P67	Capel Soar	291344	301960	2038m	R32	Yes	2 Hubs/5 Tips	20˚	Barely perceptible	None	n/a	n/a	n/a	
P68	Cwm Carnedd Isaf	291814	302644	1208m	R32	Yes	0 Hubs/2 Tips	15˚	Barely perceptible /None	None	n/a	n/a	n/a	
P69	Cwm Carnedd Uchaf	291580	302870	1206m	R32	Yes	0 Hubs/2 Tips	21˚	Low	None	n/a	n/a	n/a	
P86	Wynnstay Farm	290185	303009	2348m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	23˚	46˚	Barely Perceptible /None	
P87	Soar	290003	303052	2499m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	35˚	47˚	Barely Perceptible /None	
P94	Brynaere Uchaf	289858	304093	2470m	R31	Yes	0 Hubs/5 Tips	25˚	Barely perceptible	Yes	51˚	73˚	Barely perceptible	
P103	Bodhyfryd	290360	304663	2082m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	2˚	41˚	Barely Perceptible /None	
P104	Llwyngwern	290355	304660	2085m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	2˚	41˚	Barely Perceptible /None	
P105	Rhiwsaesin Mill	290312	304656	2125m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	2˚	41˚	Barely Perceptible /None	
P106	Pencaedu	290303	304897	2222m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	2˚	41˚	Barely Perceptible /None	
P112	Rhydymeirch	292084	306868	2122m	R7	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	160˚	160˚	Barely Perceptible /None	
P113	Clegyrnant	292154	307624	2334m	R19	Yes	0 Hubs/2 Tips	1˚	Barely perceptible /None	Yes	90˚	90˚	Barely Perceptible /None	
AP1	The Lodge	290186	305441	2594m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible /None	Yes	11˚	80˚	Barely Perceptible /None	
AP2	Opposite P109	290113	305132	2496m	R31	Yes	0 Hubs/1 Tip	1˚	Barely perceptible / None	Yes	25˚	42˚	Barely Perceptible /None	
AP4	Adjacent to P28 Pantglas	293161	300941	2289m	R39	Yes	4 Hubs/10 Tips	28˚	Barely perceptible	Yes	25˚	28˚	Barely perceptible	

ID	Property Name	OS Grid Reference		Distance from nearest turbine of Proposed Development (m)	Nearest Turbine No.	Theoretical Visibility predicted by ZTV	Number of turbines theoretically visible (hubs & blade tips)	Approximate angle of view potentially affected by turbines of the Proposed Development	Magnitude of Change to Views and Visual Amenity	Theoretical Visibility of Carnedd Wen predicted by CZTV	Approximate angle of view potentially affected by turbines of Carnedd Wen Wind Farm	Approximate angle of view potentially affected by turbines of the Proposed Development & Carnedd Wen	Magnitude of Cumulative Change to Views and Visual Amenity	Property included in detailed assessment of Effects on Living Conditions
		X	Y											
AP6	Rhosperfeydd	299061	310004	2506m	R40	Yes	20 Hubs/24 Tips	30˚	Medium	Yes	38˚	42˚	Low	

APPENDIX 4.2: LANDMAP BASELINE AND ASSESSMENT

1.1 Baseline

1.1.1 The following tables set out information on all five aspect layers from the collector records that form part of the LANDMAP dataset. Text is directly quoted from the LANDMAP dataset.

Table 1: Geological Landscape: aspect areas directly affected

Aspect Area Code & Name	**Description** (directly quoted LANDMAP GL4) **Overall Evaluation and Justification** (LANDMAP GL33 and GL34) **Guidelines** (LANDMAP GL22)
Level 3 Classification: Upland Plateau	
MNTGMGL591 Dyfnant Forest-Carredd Wen 29 turbines lie in this area	Major upland block underlain by Denbigh Grits (Middle Silurian) rising to nearly 600 m in places... In the north characterised by irregular topography with locally well developed parallel ribs of underlying geology visible (turbiditic sandstone beds in the Denbigh Grit), showing faults, folds etc... other irregular areas probably due to extensive peat deposits on the plateau... Central area partly covered by Dyfnant Forest which obliterates such features... Forms a major escarpment NE of Llanbrynmair... **High -** Major landscape feature with characteristic surface features controlled by bedrock geology and extensive Quaternary drift... **Immediate** Ensure that no surviving and significant features of geological or geomorphological significance are lost/damaged due to continuing forestry operations, including by carrying out initial geomorphological surveys to identify such features... **Medium Term** No contemporary geological map available for much of area: encourage systematic geological mapping of the area to properly document geological character...
Level 3 Classification: Other	
MNTGMGL285 Tirymynach One turbine (R43) lies within this area Part of offsite access route passes through this area	Wide vale and cwm fills between Mynydd Waun Fawr and the Dyfnant Forest massif... Includes the Alun Gaw valley... Area has a general regional structural SW-NE orientation... Includes a low scarp in the Tirymynach area.... **High** - includes key sites of regional importance (Talerddig Bridge pRIGS and Cwm Llwyd pRIGS) **Long Term** Maintain landscape character and ensure that no significant geological or geomorphological features are lost or damaged. **Immediate** Ensure that pRIGS sites are safeguarded using Local Plan policies and constraint mapping. **Medium Term** No contemporary geological map available: encourage systematic geological mapping of the area to properly document geological character.
Classification Level 3: Undulating lowland hill terrain	
MNTGMGL562 Llanerfyl Part of offsite access route passes through this area	Slopes and broad vales of the Mynydd Waun Fawr massif, including the SW-NE structurally orientated hill of Bryn-coch. **Moderate -** Typical landscape of widespread geological unit... No notable sites recorded. **Long Term** Maintain landscape character and ensure that no significant geological or geomorphological features are lost or damaged... **Medium Term**

Aspect Area Code & Name	**Description** (directly quoted LANDMAP GL4) **Overall Evaluation and Justification** (LANDMAP GL33 and GL34) **Guidelines** (LANDMAP GL22)
	No contemporary geological map available: encourage systematic geological mapping of the area to properly document geological character...
Classification Level 3: Active lowland river-flood plain system	
MNTGMGL125 Vyrnwy Part of offsite access route passes through this area	Major river system, broad in its lower part with a wide well developed floodplain and some minor development of terraces... Meanders well developed, oxbow lakes present, although locally some embankments have constructed... Clear SW-NE structural control to valley apparent in the Meifod-Llansantfraid section... Includes the much narrower Brogan and Cain tributaries - the latter with well developed smaller meander belts near Llanfechain... Upper part of system, above the Mathrafal area, much narrower and with a more upland character... General SE flow but locally bends parallel to regional SW-NE orientation... **High -** Major river system with well developed features, some potentially of at least regional significance **Long Term** Maintain natural evolving system, minimise future intervention and ensure that no significant geological or geomorphological features are lost or damaged... **Medium Term** Survey the system for significant geomorphological features and consider protection through RIG designation

Table 2: Landscape Habitats: aspect areas directly affected

Aspect Area Code & Name	**Description** (directly quoted LANDMAP LH24) **Overall Evaluation and Justification** (LANDMAP LH45) **Guidelines** (LANDMAP LH30)
Classification Level 3: Mosaic	
MNTGMLH027 Un-named 14 turbines located in this area – also part of the offsite access route passes through this area	An area of upland mosaic with acid grasslands with Juncus effusus flushes and Molinia cearulea and Nardus stricta marshy grassland... In some areas patches of heath are present... These native communities occur within a mosaic of coniferous plantation forestry and improved upland pastures... There are very few hedges and standard trees... A number of streams run through the area... **Moderate -** Just under half the aspect area comprises semi-improved or native habitats... These habitats are of moderate quality and do not cover large continuous areas however a large number of upland species are recorded from the area. **Principal management recommendations -** The native vegetation present would be enhanced by a reduction in grazing pressure and other agricultural inputs.
MNTGMLH025 Un-named 12 turbines located in this area	This mosaic of unimproved upland habitats of marshy grassland and blanket bogs in the falter area and acid grassland and bracken covered slopes on the steeper ground contains two large common land blocks... There has been some improvement of grassland on the deeper and better drained soils and the woodland plantation may well be effecting the blanket bog vegetation recorded in the common land report. **High -** Both the upland habitats present and the species they support suggest this area has a national significance in terms of species and habitats. **Principal management recommendations -** Reducing grazing pressure and looking at stopping of drainage works to enhance the diversity of the bog and wet grassland communities.
MNTGMLH012	The area is mainly grassland on the slopes of the valley sides, many of the grasslands are agriculturally improved fields with scattered blocks of

Aspect Area Code & Name	**Description** (directly quoted LANDMAP LH24) **Overall Evaluation and Justification** (LANDMAP LH45) **Guidelines** (LANDMAP LH30)
Un-named 2 turbines and one borrow pit located in this area	broadleaved woodland... The fields lead into unenclosed areas of mainly grassland with some heath and flush much of which has also seen some agricultural improvement... This is Ffridd land between the more fertile valley bottom and the unimproved semi-natural communities on the hills... **Moderate** - Both range and quantity of important habitats and species give this area a local significance. **Principal management recommendations -** Cut and manage exiting hedges to give stockproof features. Where possible encourage planting of woodland blocks to give larger areas and corridors of tree cover...
MNTGMLH018 Un-named Part of offsite access route passes through this area	An area of mainly pasture fields bounded by hedges with a number of broadleaved woodland blocks and scattered standard trees... Some of the pastures are wetter and contain flushes and native species, bracken is present in patches around the woodlands on the steeper slopes the river Gam adds to the bio-diversity of this area. **Moderate -** The habitats here are fragmented but sufficient remain of the woodland and species rich hedges which together with the important species noted in the river gives this area a local importance and a moderate evaluation. **Principal management recommendations** - Maintain and enhance hedges; allow wetter fields with some native species to revert to semi-improved plant communities by reducing agricultural inputs; plant woodland around and between existing blocks to give larger areas of tree cover.
Level 3 Classification: Coniferous Woodland	
MNTGMLH085 Un-named 3 turbines in this area	A very large block of coniferous forestry on what was once an important upland blanket bog... Even the SSSI areas remaining have been planted upon which is likely to be detrimental to the species remaining... **Low -** This area of plantation forestry does have important upland communities and species, however the trees are likely to be effecting the drainage of these and therefore the area has been evaluated as low... **Principal management recommendations** - Fell the trees within the SSSI and for a buffer around them

Table 3: Historic Landscape: aspect areas within 5km (directly affected or within ZTV)

Aspect Area Code & Name	**Description** (directly quoted LANDMAP HL4) **Overall Evaluation and Justification** (LANDMAP HL40 & 41) **Guidelines** (LANDMAP GL28 & 29)
Level 3 Classification: Marginal Land	
MNTGMHL859 Ffridd Rhyd Ddu 29 turbines lie in this area	Hilltop ridges and intervening valleys north and east of Carno, with blocks of 20th-century conifer plantation and areas of large straight-sided fields representing 19th-century enclosure of moorland and marginal land... Discrete areas of registered common land on ridges... Small, natural post-glacial lakes... Early settlement and land use is represented by complexes of dispersed, Neolithic to Bronze Age hilltop burial and ritual monuments and by dispersed abandoned prehistoric, medieval and post-medieval hilltop house sites... The Roman road running north from Caersws crosses the area. **High -** Extensive area of irregular fields with some coniferous forestry occupying straggling upland ridge... Dominated by medieval and later agriculture, but also with a number of, unevenly distributed, earlier prehistoric burial and ritual monuments... Score enhanced by virtue of its large size and therefore wide ranging content... **Guideline –** none
MNTGMHL819 Moel y Llyn Within ZTV	Extensive, unenclosed moorland and marginal land subdivided by large 19th-century polygonal enclosures... Discrete blocks of 20th-century conifer plantation... Early settlement and land use is indicated by sporadic Neolithic to Bronze Age burial and ritual monuments... Former dispersed rural settlement of the medieval and post-medieval periods is represented

Aspect Area Code & Name	**Description** (directly quoted LANDMAP HL4) **Overall Evaluation and Justification** (LANDMAP HL40 & 41) **Guidelines** (LANDMAP GL28 & 29)
	by abandoned house sites... **Moderate** - Area of relatively empty marginal land of little clear historical value... **Guideline** - none
MNTGMHL704 Trannon Moor Within ZTV	Enclosed moorland and marginal land on the hills west of Carno, with large straight-sided boundaries probably mostly of 19th-century date... Early settlement and land use indicated by complexes of Neolithic to Bronze Age upland burial and ritual sites in the northern and eastern parts of the area... The Roman road from Carno to Penycrocbren crosses the area... Later settlement and land use indicated by scattered medieval and post-medieval upland house sites and peat-cutting platforms... 20th-century windfarm development in the central part of the area... **High** - Upland moorland with concentration of earlier prehistoric burial and ritual monuments which bring up it score **Guideline** - none
MNTGMHL117 Mynydd y Cemmaes	Enclosed moorland and marginal land on upland ridges north-west of Llanbrynmair, now partly superimposed by 20th-century windfarm, with straight-sided 19th-century boundaries... Isolated blocks of 20th-century conifer plantation... Early settlement and land use indicated by clusters of Neolithic to Bronze Age burial mounds and by scattered prehistoric house sites... Later settlement and land use indicated by abandoned medieval and post-medieval house sites... **Moderate** - area of mostly unenclosed upland with some forestry... Typical range of upland historic features - scattered prehistoric funerary monuments and evidence of post medieval agriculture - but no particular focus **Guideline -** none
Classification Level 3: Woodland	
MNTGMHL790 Carnedd y Cylch 1 turbine lies in this area	Extensive 20th-century hilltop and hillslope conifer woodland and felled woodland... Early settlement and land use is indicated by scattered Neolithic to Bronze Age hilltop burial mounds and abandoned post-medieval house sites... **Low** - Area of afforested marginal land... Some early prehistoric burial sites recorded but apart from this minimal pre-forestry landscape little else is apparent. **Guideline** – none
Classification Level 3: Irregular Fieldscapes	
MNTGMHL352 Upper Banwy Part of offsite access route passes through this area	Irregular fieldscapes in the valley of the upper Banwy and its tributaries west of Llanerfyl and on the enclosed hill land and hill slopes surrounding them... Sinuous, relict ancient broadleaved woodland along steeper valley sides... Early settlement and land use indicated by grouped and more dispersed Neolithic to Bronze Age burial and ritual monuments and by the small later prehistoric hillforts at Dol Hywel, Gogerddan and Lymystyn... Small nucleated church settlement of probably early medieval origin at Llanerfyl and small post-medieval settlement at Foel a little distance away from its possible medieval predecessor, near the medieval church at Garthbeibio... Dispersed farms and cottages of post-medieval date, and occasional post-medieval water corn mills... Small, modern holiday caravan parks... **High** - Extensive area of irregular fieldscape dominated by medieval and later agricultural remains, but also significant for medieval and later settlements, a large number of prehistoric funerary and ritual monuments and a scatter of later prehistoric settlement sites... Scores highly because its size allows it a high (albeit unfocussed) historical content... **Guideline** – none
MNTGMHL768 Afon Laen / Nant	Irregular fieldscapes in the valley bottom and lower hillslopes of the Afon Laen and Nant Twmyn valleys near Llanbrynmair... Early land use and

Aspect Area Code & Name	**Description** (directly quoted LANDMAP HL4) **Overall Evaluation and Justification** (LANDMAP HL40 & 41) **Guidelines** (LANDMAP GL28 & 29)
Twmyn Part of offsite access route passes through this area	settlement is indicated by a group of Neolithic to Bronze Age burial mounds in the Staylittle area and by chance finds... The Roman road between the forts at Caersws and Pennal runs through the area... Dispersed farmsteads of later medieval and post-medieval origin, with small nucleated settlements of medieval origin at Llan and Talerddig and of post-medieval origin at Bont Dolgadfan, Llanbrynmair and Staylittle... Post-medieval industry is represented by watermills for corn and wool processing... 20th-century conifer plantations on some of the steeper hill slopes... **Moderate** - Irregular fieldscapes in the valley bottom and lower hillslopes of the Afon Laen and Nant Twmyn valleys Dominated by medieval and later agriculture with numerous farms and houses and minor medieval settlements with churches, but also some earlier prehistoric burial and ritual monuments... Diffuse... **Guideline** - none
MNTGMHL559 Allt Fawr Within ZTV	Irregular fieldscapes of medieval to post-medieval origin in the valley bottom of the river Garno, extending up the edge of the surrounding unenclosed and enclosed moorland... Discrete block of 20th-century conifer plantation with possibly residual broadleaved woodland in some steep-sided stream valleys... Later prehistoric land use and settlement indicated by the Castell Carno hillfort... The course of the Roman road between the Roman forts at Caersws and Pennal runs through... Small, nucleated post-medieval settlements at Clatter and Pontdolgoch... Dispersed farmsteads, houses and cottages of later medieval to 18th-century origin... **High** - Highly distinctive area of small irregular fields occupying the rising ground around of the upper Garno... A post medieval and earlier agricultural landscape with scattered underlying prehistoric interest **Guideline** - none

Table 4: Cultural Landscape: aspect areas within 5km (directly affected or within ZTV)

Aspect Area Code & Name	**Description** (directly quoted LANDMAP CL17) **Overall Evaluation and Justification** (LANDMAP CL40 & 41) **Guidelines** (LANDMAP CL23 and/or 24)
Level 3 Classification: Rural	
MNTGMCL051 Rural Landscapes All 30 turbines lie in this area	The Aspect Area is essentially a catch-all of landscapes surrounding other Aspect Areas... It reveals an eclectic mix of landscape type, from fertile lowlands to bleak moorlands, and forms a buffer between other Aspect Areas that are more culturally distinctive or diverse... Surprisingly, there are few statutorily protected landscape types - such as SSSIs or SLAs within the area... Nevertheless, Rural Landscapes forms the background to the more detailed painting on the canvas of Montgomeryshire, contributing greatly to the county's soubriquet of Powis paradwys Cymru.... **High** as a varied, visually rich rural landscape of a wide topographical range that provides the framework for the Study Area as a whole. **Guideline: Immediate** Seek more imaginative means of keeping young people closer to the land and their roots by encouraging regenerative or small business activity in this age of the world wide web and e-commerce **Medium Term** Seek to ensure sustainability of income and provide subsidy to retain people so that they may nurture the landscape **Long Term** Provide grants and/or subsidies for the maintenance of structures in the landscape

Aspect Area Code & Name	**Description** (directly quoted LANDMAP CL17) **Overall Evaluation and Justification** (LANDMAP CL40 & 41) **Guidelines** (LANDMAP CL23 and/or 24)
MNTGMCL053 Llanbrynmair Within ZTV	The parish and village of Llanbrynmair stands astride Wales's main north-south road (A470) and through it passes the "rat-run" minor road B4518 via Clywedog and Staylittle... The original settlement of Llan gave its name to the longer name of Llanbrynmair at the coming of the 19th century turnpike road through the then hamlet of Wynnstay... The parish contain a number of small settlements, in addition to the attractive hilltop Llan, which show evidence of occupation and evolution over many centuries and which contain much of their original character... The influential champion of rural vernacular buildings, Iorwerth Peate, was born in the parish... The character of the larger settlement of Llanbrynmair has been compromised by "bungaloid" growth built of plain, boring and inappropriate materials and to an especially dull design. **Moderate** because of undistinguished modern development having been permitted. **Guideline: Medium Term** Planners should consider using their powers to insist on more appropriate use of materials and site design for any future developments.
Classification Level 3: Places	
MNTGMCL044 River Valleys Part of offsite access route passes through this area	These eastward-trending river valleys dominate the landscape of Montgomeryshire... Their streams mostly flow from Pumlumon, Berwyn and lesser ranges... They are variously broad or steepsided (or both) and contain most of the historic settlements in the middle and north of the Study Area as a result of being the most convenient terrain for communications routes (except those in such Aspect Areas as MONTSCL001 - River Severn; MONTSCL003 - Vyrnwy River Valley; MONTSCL015 - Tanat Valley; MONTSCL016 - Clywedog Valley)... They are chosen as a single Aspect Area not because of the similarity of their topography (which differs markedly) but because of the evidence of long-term settlement and exploitation of the adjacent terrain caused by topography... Without exception, each displays more than average aesthetic qualities... Many of the settlements within them have been selected as Aspect Areas in their own right - and these valleys provide the wider cultural context for them. **High** as typifying the cultural variety in the river valley landscapes of the middle and northern parts of the Study Area. **Principal management recommendations** - Apply planning regulations more stringently on the design and scale of new build.

Table 5: Visual & Sensory: aspect areas within 10km (directly affected or within ZTV)

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
Level 3 Classification: Wooded Upland & Plateaux	
MNTGMVS320 Banwy Forest 15 turbines lie in this area	A large and extensive area of blanket forestry dominating the upland area between the Banwy and Tafalog/Rhiwsaeson valley systems...Visually dominant and in extreme contrast to the open upland grazing and rolling farmland that forms the wider landscape context.... **Low** - Large scale coniferous afforestation blankets the subtleties of the underlying landform and produces intrusive conifer fringes and harsh plantation edges into an otherwise open expanse of upland moorland and grazing, little/no public access **Guideline: Medium Term** Diversify with broadleaf native species to visually integrate and widen appeal **Medium Term** Improve public access **Medium Term** Break up regular straight edges to planting - feather forestry edge to follow landform and improve species diversity
MNTGMVS500 Dyfnant Forest Within ZTV	Large and extensive block of mixed age coniferous plantation and forestry with a distinct path network and public access throughout... Broad areas of clear felling create desolate open areas in contrast to the blanket single species planting elsewhere within the aspect... Isolated pockets of cultivated small scale farming make a welcome contrast to the mass planting. **Moderate** - In contrast with some of the other forestry areas within the study area opportunities have been taken to modify the forestry management through smaller scale more irregular compartment felling, further opportunity should be taken to diversify species type and feather forestry edge to emphasis the underlying topography. **Guideline** **Immediate** Promote and encourage public access **Medium Term** Break up regular straight edges to moorland edge - "feather" forestry to follow landforms **Medium Term** Further planting should integrate with existing topography - expose peaks, rock outcrops and local features **Medium Term** Clear felled areas provide opportunity to diversify species type - introduce more broadleaf species to lower lying areas.
MNTGMVS694 Carno Uplands Within ZTV	A relatively small area of upland to the north of Carno which forms the visual backdrop to both the settlement and Carno valley itself. A series of rounded peaks -Allt Fawr, Cryniarth and Yr Allt-rising in places to 450 metres AOD. The openness is somewhat compromised by the presence of large blocks of conifer plantations with hard often angular edges which pay little respect to landform and landscape character. The area is dissected by a number of streams and small watercourses inc. Nant Cwmgerwyn. **Moderate** -Typical of much of the area with open heath and moor adversely affected by conifer plantations. **Guideline** **Long Term** Look to soften edges of plantations **Long Term** Increased impact of windfarms.
MNTGMVS293	Relatively small coniferous woodland overlying a steeply contoured upland and surrounded by open upland grazing... Single species mass planting

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
Esgair Geulan Within ZTV	with little age or species diversity, the area creates a harsh image at odds with the landform and surrounding open or managed landscape types. **Moderate** - Single species mass planting of forestry that is more easily integrated into the landscape due to its relatively small size, also benefits and borrows from the adjacent aspect areas of higher aesthetic quality. **Guideline** **Medium Term** Encourage replanting with broadleaf and deciduous species Medium Term Take advantage of felled compartments to open up views and expose landform - rock exposure etc **Medium Term** Encourage public access and interpretation
Classification Level 3: Mosaic Upland & Plateaux	
MNTGMVS264 Banwy Upland 11 turbines lie in this area	The continuation of the upland plateau and ridge that carries the extensive forestry of the Banwy Forest - upland grazing with a mosaic of heather/bilberry scrub and marginal rough grazing with intermittent small forestry blocks... Open and extensive views to the surrounding successive upland ridges and into the Dyfi Valley Catchment... Marginal, remote with wide open skies and relative lack of human traffic/intervention. **Moderate** - Mosaic upland that would benefit greatly from diversification of existing forestry blocks and introduction of broadleaf / deciduous species to plateau edges. **Guideline: Medium Term** Improve species diversity for forestry blocks - introduce mixed broadleaf and deciduous species **Medium Term** Control invasive bracken and gorse growth **Long Term** Restore / reintroduce moorland element into vegetative cover to areas adjacent forestry blocks **Medium Term** Introduce intermittent broadleaf tree cover to plateau edges emphasising landform and valley courses.
MNTGMVS363 Newydd Fynyddog Within ZTV	A transitional landscape between the open and exposed moorland of the Trannon Moors and the more domesticated hill slopes mosaic grazing leading into the Dovey Valley... Largely weakly enclosed marginal grazing land with an area of small scale irregular fields associated with a farm settlement to the centre of the area... Clear and extensive views are available over the Trannon Moors and to the wind farm south of the aspect and over the small scale well enclosed farming land River Dyfi catchment area to the north... Borderline wilderness due to the weak enclosure and vegetation type... Open, exposed, wide open skies dominate most of the area. **Moderate** - Upland area with dramatic visual link to the upland moorland of the Trannon Moors, however some forestry blocks and the extensive development of the Trannon Windfarm degrades this visual appreciation of the area. **Guideline** **Medium Term** Strengthen field boundaries within the small scale field patterns adjacent Hafodwen. **Long Term** Maintain existing balance between open weakly enclosed rough grazing and small scale sheltered fields.
Classification Level 3: Upland Grazing	

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
MNTGMVS571 Pen Coed Upland 4 turbines lie in this area	A relatively narrow band of higher level upland grazing that forms a break between the Banwy and Dovey Valley catchment areas... Its form is more apparent due to the course that the A548(T) takes over the highest level before dropping down into the Dovey Valley and joining with the A470(T)... Rough grazing semi improved with damp marshy grazing in places and isolated blocks of forestry on upper slopes, extensive livestock grazing weakly enclosed with an upland backdrop of forestry and moorland... **Moderate** - A subsidiary area of a larger upland grazing complex associated with the extensive upland moorland regions on the western borders of Montgomeryshire and Gwynedd - this area is the east west watershed between the main watercourses that make up the study area but is dominated by the extensive upland ranges north and south and contains the busy A458(T) transport corridor. **Guideline: Medium Term** Control bracken and gorse growth **Medium Term** Ensure forestry plantation integrates with existing landform and contains percentage of broadleaf species.
MNTGMVS733 Esgair Cwmowen Uplands Within ZTV	An extensive area of upland grazing with a patchwork vegetation cover of rough grazing, heather and bracken, irregular field patterns running with the topography and intermittent small blocks of coniferous and mixed woodland... Exposure and wind are dominant features with isolated more intimate areas with small irregular hedged fields in sheltered areas to the edge of the area. **High** - Good example of patchwork upland grazing that is characterised by the field patterns and land use emulating the topography. **Guideline** **Medium Term** Manage bracken to maintain existing balance of agricultural practices.
MNTGMVS796 Rhiw Goch Within ZTV	Area of upland grazing with weakly enclosed marginal and unimproved grazing with isolated blocks of forestry and predominantly single species planting that follow the drainage patterns and valleys leading over the plateau edge... Clear and aesthetic views over the surrounding traditionally farmed landscape of the Dyfi Valley mosaic. **Moderate** - Upland grazing with small woodland blocks that would benefit from species diversification and modification to follow the existing landform... Dramatic views over the Dyfi Valley but suffers from some visual degradation through the proliferation of forestry plantation. **Guideline** **Immediate** Improve species diversity of forestry blocks - introduce broadleaf species **Medium Term** Control invasive bracken and gorse scrub
Classification Level 3: Hillside & Scarp Slopes Mosaic	
MNTGMVS422 Llanerfyl Mosaic Farmlands Some access tracks in this area – also part of the offside access passes through this area	Distinct area typical of the mid regions of Montgomeryshire of small scale irregular fields patterns with very strongly defined field boundaries typified by overgrown and managed hedgerows with a significant proportion of mature hedgerow trees... Small to medium sized mixed broadleaf woodland is common in lower lying areas and especially found along watercourses... A succession of low rolling hills with gently sloping sides and rounded tops underlying a very traditional farming landscape - high aesthetic qualities, settled, domestic setting. **High** - Well defined example of a traditionally farmed landscape, small scale field patterns with a diverse vegetation cover of hedgerows with hedgerow trees, mixed broadleaf woodland parcels... High aesthetic

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
	qualities and limited intrusion by modern development. **Guideline: Medium Term** Encourage further use of traditional land management techniques ie hedge laying / coppicing **Long Term** Phased replanting of hedgerow boundaries to maintain existing character **Medium Term** Control new development in association with farm settlements integrate with existing landscape pattern
MNTGMVS278 Pont Llogel Farmlands Within ZTV	An extensive area that in conjunction with the hill and scarp mosaic of Llanfyllin and Guilsfield is typical of the rolling traditional farmland of Mid Montgomeryshire... Strongly defined field pattern that follows the underlying topography, small scale, irregular field parcels spreading over a succession of rolling ridges... Locally, hilltop grouped trees and marshy un or semi improved damp grazing is common... Wooded areas congregate around watercourses and follows small scale valleys to the edges of the area... Domestic, settled character with traditional land management techniques such as hedge laying and coppiced woodland areas. **High** - Needs to be read in conjunction with the hill and scarp mosaic areas adjacent to Llanfyllin and Guilsfield as a part of the dominant landscape type for Mid Montgomeryshire, a traditional farming landscape that is under economic pressure to modernise farming practices that may degrade the existing character. **Guideline** **Long Term** Encourage medium to long term replanting of hedgerow boundaries and employ traditional management practices **Long Term** Maintain mosaic of small scale field patterns
MNTGMVS764 Newydd Fynyddog Mosaic Hillside Within ZTV	Area of hillside semi improved grazing that forms the transitional landform between the upland moorlands and unimproved grazing of the Plinlimon Moors and the fertile farmlands of the Dyfi floodplain... Small to medium scale irregular field patterns bounded by a mixture of boundary treatments - predominantly well defined and overgrown hedgerows with associated mixed woodland patches. **High** - Forms part of a rich mosaic traditionally farmed grazing land that spreads form the mosaic uplands above towards the fertile Dyfi Valley lowlands, High aesthetic appeal and borrows much from the aesthetic appeal of the surrounding aspects. **Guideline** **Medium Term** Encourage adoption and proliferation of traditional farming practices such as hedge laying **Medium Term** Improve species diversity concentrating on mixed broadleaf, oak and beech woodland
MNTGMVS460 Clegyrnant Grazing Within ZTV	Narrow valley of irregular and well wooded field patterns - fields are small to medium in size with well defined and distinct field boundaries giving the appearance of a traditional and well maintained farming landscape... Enclosed views due to the steeply rising upland plateau areas to the west and east provides an intimate and domestic scale and reminiscent of "lost valley". **High** - High proportion of mixed woodland parcels and well defined hedgerow boundaries with steeply valley sides emphasises the traditional and aesthetically pleasing farming landscape and "lost valley" sense of place.

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
	Guideline **Medium Term** Encourage phased replanting of mixed woodland blocks and parcels **Medium Term** Encourage / proliferate use of traditional land management techniques ie hedge laying and coppicing.
MNTGMVS441 Cemmaes Scarp Within ZTV	Steeply undulating and rising hillsides slopes preceding the upland area of Mynydd y Cemmaes and its windfarm... Traditionally farmed landscape with small scale field patterns reflecting the underlying landform and displaying a well defined pattern with hedgerows and hedgerow trees the dominant landscape feature... Some incidental mixed woodland patches largely following lower lying areas and watercourses... Settled and domesticated landscape that would benefit from a higher proportion of mixed woodland parcels to emphasise the landform... Relatively good clear views available from with much of the area over the rolling mosaic farmland of the Dyfi Valley and towards the rising upland hinterland of the SNP to the west and north. **Moderate** - Aspect would benefit from enrichment planting with mixed broadleaf woodland to reflect landform and the undulating valley forms dropping down from the adjoining upland plateau... Generally an aesthetically pleasing and traditional farmed landscape that borrows from the high visual qualities of its adjacent aspects and is read as a part of the Dyfi Valley complex as a whole rather than individually. **Guideline** **Medium Term** Encourage mixed broadleaf woodland planting to lower lying areas and in association with field boundaries **Medium Term** Encourage / introduce traditional land management techniques ie... hedge laying
Classification Level 3: Hillside & Scarp Slopes Grazing	
MNTGMVS493 Dyfi Valley Rolling Grazing Within ZTV	An extensive area of hillside semi improved grazing that forms the transitional landform between the upland moorlands and unimproved grazing of the Plinlimon Moors and the fertile farmlands of the Dyfi floodplain... Small to medium scale irregular field patterns bounded by a mixture of boundary treatments - gappy hedgelines and fences some limited examples of stone walling at upper levels... Numerous scattered farmsteads and small clustered settlements based on extensive and traditional farming practices. **Moderate** - An extensive and good example of hillside grazing and a traditionally farmed landscape that would benefit from enrichment planting of woodland parcels and strengthening of field boundaries. **Guideline** **Medium Term** Encourage replanting and enrichment planting to strengthen field boundaries **Medium Term** Improve species diversity in woodland parcels with greater range of broadleaf and deciduous species **Medium Term** Encourage adoption of traditional farming techniques such as hedge laying
MNTGMVS337 Cwm Tafalog Within ZTV	A narrow valley formed by the steeply sided plateau ridges of the Mynydd Lluest Fach and Mynydd y Cemmaes... Traditional farming landscape with irregular field patterns and diverse vegetation cover with semi improved and marginal grazing with the valley slopes displaying rough grazing, bracken and gorse scrub... Enclosed, remote in part due to the steep

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
	landforms on either side that cut off the outer world - "lost valley" sense of place. **Moderate** - Small and intimate scale traditionally farmed landscape that would benefit from enrichment planting of mixed broadleaf woodland parcels, due to its confined topographic form can also be quite oppressive in poor / dull weather. **Guideline** **Medium Term** Improve hedgerow boundaries in valley floor to strengthen field pattern **Medium Term** Encourage proliferation of mixed woodland blocks to valley floor and sides **Medium Term** Control invasive bracken and gorse growth
Classification Level 3: Flat Open Lowland Farmland	
MNTGMVS119 Banwy Floodplain Within ZTV	Relatively narrow and steepsided valley system with an open valley floor of well defined small to medium scale field pattern associated with the Afon Banwy... Predominantly semi improved grassland with a proportion of damp pasture land associated with the river course... Damp woodland also a strong characteristic of the area... Transport corridor A458 (T) principal east west route between Welshpool and SNP linking with the A470 (T). **Moderate** - Narrow river corridor with dispersed small to medium settlements dominated by the surrounding steep valley sides, lower slopes and valley bottoms tend to carry the main arterial transport routes through the study area and detract from the overall aesthetic quality of the aspect... The open flat valley bottoms and proximity to arterial transport routes make the area vulnerable to larger scale development that may be out of keeping with the landform and existing field pattern. **Guideline** **Medium Term** Encourage medium to long term replanting of hedgerow boundaries - employ traditional land management practices ie hedge laying **Medium Term** Limit further expansion of new development especially caravan parks - should be small scale and fit with existing field patterns and landform
Classification Level 3: Upland Moorland	
MNTGMVS368 Berwyn Uplands Within ZTV	A very broad extensive area of upland moorland plateau on the edge of the Snowdonia National Park... The aspect is very strongly linked visually to the SNP with the moorland plateau taking on the characteristic of upland peak hinterland... Open, exposure and wide open skies dominate with heather/bilberry and rough grazing predominant and bracken growth to lower plateau sides...Some upland lakes area evident with a number of large boggy areas in lower lying and poorly drained areas. **High** - Extensive dramatic and high aesthetic quality long distance views out towards the SNP and Berwyn mountains coupled with the high/outstanding quality of the habitat are tempered by the views within the aspect tending to be more monotone in the broad expanse of gently rolling upland and degraded in places by the broad expanses of upland coniferous plantation that sit at odds with the overall open moorland character of the area. **Guideline** **Medium Term** Limit expansion of coniferous forestry plantations.
MNTGMVS179 Trannon Moors	An isolated area of upland moorland more usually found to the southern and western borders of the study area...Open, exposed and wide open

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
Within ZTV	skies dominate with heather/bilberry and rough unimproved grassland predominant with bracken and gorse growth to lower edges adjacent upland grazing... An extensive wind farm development dominates the central and southern half of the area and provides a dramatic feature in an otherwise open but dramatic landscape. **Moderate** - Upland moorland that suffers from some degradation due to the extensive forestry adjacent to the south and extensive wind farm development. **Guideline** **Medium Term** Limit further wind farm development **Medium Term** Control bracken and gorse growth
MNTGMVS147 Mynydd Lluest Fach Within ZTV	A distinct plateau landform bounded by the narrow valleys of the Afon Rhiwsaeson and Clegyrnant... The plateau is steep sided and displays a number of waterfalls falling from the watercourses draining it... Extensive area of marginal upland grazing and moorland... Open expose with dramatic clear views to the surrounding upland and into the adjacent wooded valleys. **Moderate** - Some degradation to the aesthetic qualities of the aspect through proximity of Banwy Forest and the adjacent wind farm - although the wind farm provides a dramatic focal point in its own right. **Guideline** **Medium Term** Discourage expansion of the forestry planting at Banwy Forest.
MNTGMVS413 Mynydd y Cemmaes Within ZTV	Large upland ridge/plateau area with steep sided valleys formed by the Dyfi valley to the west and the Afon Rhiwsaeson to the east... Dramatic and extensive clear views are available over the surrounding rolling lowland farmland of the Dyfi Valley and towards the rising upland and mountains of the SNP... Much of the exposed ridge is occupied by an extensive windfarm development that provides a strong visual focus for the surrounding westerly lowlands... Open, exposed and with a remote borderline wilderness air to the area it also forms an important topographic feature in forming part of the eastern boundary for the Dyfi floodplain catchment. **High** - Wind turbines provide a contrasting visual experience and overall focus for the surrounding area that does not necessarily degrade or detract from the aesthetic quality - rather it complements it and provides for a unique experience. **Guideline** **Long Term** Prevent further expansion of the windfarm **Medium Term** Maintain existing minimal and marginal moorland upland grazing management **Medium Term** Discourage further afforestation and encourage species diversity in existing forestry plantation
SNPVS105 Bwlch y Groes uplands Within ZTV	Upland moorland hills & valleys... Heather slopes add colour to green / brown dominant tone... Good weather borrowed views to Aran ridge and Arenig mountains... Scattered conifer plantations detract from moorland feel (e...g... at Foel Y Geifr) but overall sense of exposure... Strong sense of place derived predominantly with strong association with distinctive ridge line of Aran mountains... Distinct feeling of "arrival" when driven up from the east. **High** - strong upland sense of place imparted by strong visual links with

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
	Aran ridge and general feel of exposure and altitude **Guideline** **Medium Term** forestry plantation
Classification Level 3: Hill & Lower Plateau Grazing	
MNTGMVS696 Carno Grazing Within ZTV. Part of offsite access passes through this area.	A traditional livestock farming landscape with a strongly defined field pattern - managed hedgerow boundaries and small to medium sized field patterns are a signature element for the aspect... The area forms part of the A470(T) and rail transport corridor and as such is an important thoroughfare and tourist route attracting development ... Grazing types range from semi improved grassland to marginal grazing on the upper slopes... Settlements tend to be small, clustered and other than Carno in the centre of the area have few facilities... Some new development has taken place in the form of caravan parks and light industrial development that need careful design to integrate into the existing field patterns. **Moderate** - typical traditional farming landscape of the mid and eastern extents of the study area exhibiting some degradation through pressure from development due to its proximity to the A470(T) transport corridor and tourist route to North Wales. **Guideline** **Medium Term** Encourage employment of traditional farming practices - hedge laying and coppicing **Immediate** Ensure new development is carefully integrated into existing landscape character - respect field patterns and vegetation cover **Medium Term** Enrich and strengthen field boundaries - additional hedgerow replanting where fields have been amalgamated
Classification Level 3: Hill & Lower Plateau Mosaic	
MNTGMVS235 Carno Mosaic Within ZTV	A traditional livestock farming landscape with well wooded and strongly defined field pattern - overgrown and managed hedgerow boundaries with intermittent grouped broadleaf trees a signature element for many of the boundaries... The area forms part of the A470(T) transport corridor and as such is an important thoroughfare and tourist route... Grazing types range from semi improved grassland to marginal grazing on the upper slopes... Settlements tend to be small, clustered and other than Carno in the centre of the area have few facilities... Some new development has taken place in the form of caravan parks and campsites that need careful design to integrate into the existing field patterns. **Moderate** - Typical traditional farming landscape of the mid and eastern extents of the study area exhibiting some degradation through pressure from development due to its proximity to the A470(T) transport corridor and tourist route to North Wales. **Guideline** **Medium Term** Maintain small scale field pattern - replenishment planting for hedgerows and wooded patches **Immediate** Ensure new development is carefully integrated into existing landscape character - respect field patterns and vegetation cover **Medium Term** Encourage employment of traditional farming practices - hedge laying and coppicing.
Classification Level 3: Mosaic Lowland Valleys	

Aspect Area Code & Name	**Description** (directly quoted LANDMAP VS3) **Overall Evaluation and Justification** (LANDMAP HL50 & 51) **Guidelines** (LANDMAP VS32)
MNTGMVS276 Dyfi Valley Catchment Within ZTV	A very extensive network of valleys containing tributaries leading into the River Dyfi... The area has a dramatic backdrop to the south with the underlying landform falling from the upland moorlands of the Trannon and Plinlimon moors... To the north views are over a picturesque traditionally farmed landscape edged by sporadic rock exposure and marginal grazing land facing onto the meandering Dovey Valley and with a northerly backdrop of steeply rising upland and the edge of SNP... Settled safe, and domestic in scale the traditional farmed elements make a stunning foreground for the picturesque hill and mountainscape of the SNP. **High** - Settled safe, and domestic in scale the traditional farmed elements make a stunning foreground for the picturesque hill and mountainscape of the SNP and the River Dovey **Guideline** **Medium Term** Encourage adoption/proliferation of traditional farming techniques - Hedge laying, vernacular style stone walling **Medium Term** Limit intrusive developments out of keeping with small scale scattered developments such as caravan parks **Long Term** Limit intrusive single species forestry plantation on upper slopes - should follow landforms, be diverse in species and of relatively small scale.

1.2 LANDMAP Assessments

1.2.1 The following tables set out an appraisal of the LANDMAP aspect areas in each of the five aspect layers.

Table 6: Effects on Geological Landscape (aspect areas directly affected)

Aspect Area Code & Name	Nature of the Receptor & Judgement on Sensitivity (Description directly quoted LANDMAP GL4; Overall Evaluation and Justification from LANDMAP GL33 and GL34; and Guidelines from LANDMAP GL22)	Nature of the Effect
Level 3 Classification: Upland Plateau		
MNTGMGL591 Dyfnant Forest-Carredd Wen 28 turbines, access tracks, 5 borrow pits, two temporary site compounds, the temporary batching plant and the substation lie in this area	Major upland block underlain by Denbigh Grits (Middle Silurian) rising to nearly 600 m in places... In the north characterised by irregular topography with locally well developed parallel ribs of underlying geology visible (turbiditic sandstone beds in the Denbigh Grit), showing faults, folds etc... other irregular areas probably due to extensive peat deposits on the plateau... Central area partly covered by Dyfnant Forest which obliterates such features... Forms a major escarpment NE of Llanbrynmair... **Overall Evaluation: High -** Major landscape feature with	The wind farm will alter surface geological/ geomorphological features locally where turbines, tracks, borrow pits and compounds are located. However, the extensive plateau landform which occupies an area of some 15,800 hectares would remain intact. Ground disturbance will be restored, including temporary storage of turves and peat and replacement post construction as set out in the Outline Habitat Management Plan (the re-vegetated areas will be monitored).

Aspect Area Code & Name	Nature of the Receptor & Judgement on Sensitivity (Description directly quoted LANDMAP GL4; Overall Evaluation and Justification from LANDMAP GL33 and GL34; and Guidelines from LANDMAP GL22)	Nature of the Effect
	characteristic surface features controlled by bedrock geology and extensive Quaternary drift... **Immediate** Ensure that no surviving and significant features of geological or geomorphological significance are lost/damaged due to continuing forestry operations, including by carrying out initial geomorphological surveys to identify such features... **Medium Term** No contemporary geological map available for much of area: encourage systematic geological mapping of the area to properly document geological character...	
Level 3 Classification: Other		
MNTGMGL285 Tirymynach Two turbines (R18 and R43), a borrow pit, three site compounds and access tracks lie within this area Part of offsite access route passes through this area	Wide vale and cwm fills between Mynydd Waun Fawr and the Dyfnant Forest massif... Includes the Alun Gaw valley... Area has a general regional structural SW-NE orientation... Includes a low scarp in the Tirymynach area.... **Overall Evaluation: High** - includes key sites of regional importance (Talerddig Bridge pRIGS and Cwm Llwyd pRIGS) **Long Term** Maintain landscape character and ensure that no significant geological or geomorphological features are lost or damaged. **Immediate** Ensure that pRIGS sites are safeguarded using Local Plan policies and constraint mapping. **Medium Term** No contemporary geological map available: encourage systematic geological mapping of the area to properly document geological character.	There will be localised changes to surface geology in this area. However, the proposed development will not affect the vale or scarp landforms, significant geological or geomorphological features or sites of regional geological importance The Talerddig Cutting RIGS (Grid Reference: SH 9283 0043) will not be affected. [No information on Talerddig Bridge pRIGS and Cwm Llwyd pRIGS was found on the Central Wales RIGs website at **http://www.geologywales.co.uk/central-wales-rigs/Powys_RIGS.htm**]
Classification Level 3: Undulating lowland hill terrain		
MNTGMGL562 Llanerfyl Part of offsite access route passes through this area	Slopes and broad vales of the Mynydd Waun Fawr massif, including the SW-NE structurally orientated hill of Bryn-coch. **Overall Evaluation: Moderate -** Typical landscape of widespread	The proposed development will not affect the broad vale landform or significant geological or geomorphological features.

Aspect Area Code & Name	Nature of the Receptor & Judgement on Sensitivity (Description directly quoted LANDMAP GL4; Overall Evaluation and Justification from LANDMAP GL33 and GL34; and Guidelines from LANDMAP GL22)	Nature of the Effect
	geological unit... No notable sites recorded. **Long Term** Maintain landscape character and ensure that no significant geological or geomorphological features are lost or damaged... **Medium Term** No contemporary geological map available: encourage systematic geological mapping of the area to properly document geological character...	
Classification Level 3: Active lowland river-flood plain system		
MNTGMGL125 Vyrnwy Part of offsite access route passes through this area	Major river system, broad in its lower part with a wide well developed floodplain and some minor development of terraces... Meanders well developed, oxbow lakes present, although locally some embankments have constructed... Clear SW-NE structural control to valley apparent in the Meifod-Llansantfraid section... Includes the much narrower Brogan and Cain tributaries - the latter with well developed smaller meander belts near Llanfechain... Upper part of system, above the Mathrafal area, much narrower and with a more upland character... General SE flow but locally bends parallel to regional SW-NE orientation... **Overall Evaluation: High -** Major river system with well developed features, some potentially of at least regional significance **Long Term** Maintain natural evolving system, minimise future intervention and ensure that no significant geological or geomorphological features are lost or damaged... **Medium Term** Survey the system for significant geomorphological features and consider protection through RIG designation	The proposed development will not affect this valley landform, floodplain or river system.

Table 7: Effects on Landscape Habitats (aspect areas directly affected)

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP LH24; Overall Evaluation and Justification from LANDMAP LH45; Guidelines from LANDMAP LH30)	Nature of Effect
Classification Level 3: Mosaic		
MNTGMLH027 Un-named 12 turbines, access tracks, the substation, three temporary site compounds, the batching plant and two borrow pits are located in this area – also part of the offsite access route passes through this area	An area of upland mosaic with acid grasslands with Juncus effusus flushes and Molinia cearulea and Nardus stricta marshy grassland... In some areas patches of heath are present... These native communities occur within a mosaic of coniferous plantation forestry and improved upland pastures... There are very few hedges and standard trees... A number of streams run through the area... **Overall Evaluation: Moderate -** Just under half the aspect area comprises semi-improved or native habitats... These habitats are of moderate quality and do not cover large continuous areas however a large number of upland species are recorded from the area. **Principal management recommendations -** The native vegetation present would be enhanced by a reduction in grazing pressure and other agricultural inputs.	Mostly improved grassland will be affected by tracks and turbines in this aspect area, although there will be some loss of mire habitat. The project will include bog heath restoration and provision of additional damp areas in this aspect area, as set out in the Outline HMP (see Appendix 5.2), and overall there will be an imperceptible change in the way that landscape habitats contribute to landscape character in this aspect area. The aspect area will remain an area of upland mosaic.
MNTGMLH025 Un-named 12 turbines, access tracks, two borrow pits and a temporary compound are located in this area	This mosaic of unimproved upland habitats of marshy grassland and blanket bogs in the flatter area and acid grassland and bracken covered slopes on the steeper ground contains two large common land blocks... There has been some improvement of grassland on the deeper and better drained soils and the woodland plantation may well be effecting [*sic*] the blanket bog vegetation recorded in the common land report. **Overall Evaluation: High -** Both the upland habitats present and the species they support suggest this area has a national significance in terms of species and habitats. **Principal management recommendations-** Reducing grazing pressure and looking at stopping of drainage works to enhance the diversity of the bog and wet grassland communities.	A mixture of improved grassland and mire will be affected by tracks and turbines in this aspect area. However there will be blanket bog restoration and provision of additional damp areas in this aspect area, as set out in the Outline HMP (see Appendix 5.2), and overall there will be an imperceptible change in the way that landscape habitats contribute to landscape character in this aspect area.
MNTGMLH012 Un-named 2 turbines and one borrow pit located in	The area is mainly grassland on the slopes of the valley sides, many of the grasslands are agriculturally improved fields with scattered blocks of broadleaved woodland... The fields lead into unenclosed areas of	Only a very small area of Perennial Rye-grass grassland will be lost in this aspect area. There will be an imperceptible change in the way that landscape habitats contribute to landscape character in this aspect

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP LH24; Overall Evaluation and Justification from LANDMAP LH45; Guidelines from LANDMAP LH30)	Nature of Effect
this area	mainly grassland with some heath and flush much of which has also seen some agricultural improvement... This is Ffridd land between the more fertile valley bottom and the unimproved semi-natural communities on the hills... **Moderate** - Both range and quantity of important habitats and species give this area a local significance. **Principal management recommendations -** Cut and manage exiting hedges to give stockproof features. Where possible encourage planting of woodland blocks to give larger areas and corridors of tree cover...	area.
MNTGMLH018 Un-named Part of offsite access route passes through this area	An area of mainly pasture fields bounded by hedges with a number of broadleaved woodland blocks and scattered standard trees... Some of the pastures are wetter and contain flushes and native species, bracken is present in patches around the woodlands on the steeper slopes the river Gam adds to the bio-diversity of this area. **Overall Evaluation: Moderate -** The habitats here are fragmented but sufficient remain of the woodland and species rich hedges which together with the important species noted in the river gives this area a local importance and a moderate evaluation. **Principal management recommendations** - Maintain and enhance hedges; allow wetter fields with some native species to revert to semi-improved plant communities by reducing agricultural inputs; plant woodland around and between existing blocks to give larger areas of tree cover.	Some sections of hedgerow will be lost along the offsite access road due to road widening along the delivery route for turbines. There will also be loss of some trees at Gosen due to the bridge widening works. However, vegetation loss will be localised and will be replaced with the same, or improved, features ensuring that in the long term there will be an imperceptible change in the way that landscape habitats contribute to the landscape character of this aspect area as a whole.
Level 3 Classification: Coniferous Woodland		
MNTGMLH085 Un-named 4 turbines, access tracks and one borrow pit are located in this area	A very large block of coniferous forestry on what was once an important upland blanket bog... Even the SSSI areas remaining have been planted upon which is likely to be detrimental to the species remaining... **Overall Evaluation: Low -** This area of plantation forestry does have important upland communities and species, however the trees are likely to be effecting [*sic*] the drainage of these and therefore the area has	Some areas of coniferous forestry will be felled and there will be some blanket bog restoration which will result in a positive change to landscape habitats in a small part of this aspect area. However, overall the majority of the aspect area will remain forested and there will be an imperceptible change in the way that landscape habitats contribute to landscape character in this aspect area.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP LH24; Overall Evaluation and Justification from LANDMAP LH45; Guidelines from LANDMAP LH30)	Nature of Effect
	been evaluated as low... **Principal management recommendations** - Fell the trees within the SSSI and for a buffer around them	

Table 8: Effects on Historic Landscape within 5km (directly affected or within ZTV)

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP HL4; Overall Evaluation and Justification from LANDMAP HL40 & 41; Guidelines from LANDMAP GL28 & 29)	Nature of Effect
Level 3 Classification: Marginal Land		
MNTGMHL859 Ffridd Rhyd Ddu 29 turbines, access tracks, five borrow pits, three temporary compounds, the batching plant and the substation lie in this area	Hilltop ridges and intervening valleys north and east of Carno, with blocks of 20th-century conifer plantation and areas of large straight-sided fields representing 19th-century enclosure of moorland and marginal land... Discrete areas of registered common land on ridges... Small, natural post-glacial lakes... Early settlement and land use is represented by complexes of dispersed, Neolithic to Bronze Age hilltop burial and ritual monuments and by dispersed abandoned prehistoric, medieval and post-medieval hilltop house sites... The Roman road running north from Caersws crosses the area. **Overall Evaluation: High -** Extensive area of irregular fields with some coniferous forestry occupying straggling upland ridge... Dominated by medieval and later agriculture, but also with a number of, unevenly distributed, earlier prehistoric burial and ritual monuments... Score enhanced by virtue of its large size and therefore wide ranging content... **Guideline –** none	29 turbines, access tracks, five borrow pits, three temporary compounds, the batching plant and the substation will be introduced to this area. However, the Proposal will not affect the survival of any of the recognised elements of the historic landscape (including the post-glacial lakes, Neolithic to Bronze Age hilltop burial and ritual monuments, dispersed abandoned prehistoric, medieval and post-medieval hilltop house sites and the Roman road running north from Caersws) or the potential for future study.
MNTGMHL819 Moel y Llyn Within ZTV	Extensive, unenclosed moorland and marginal land subdivided by large 19th-century polygonal enclosures... Discrete blocks of 20th-century conifer plantation... Early settlement and land use is indicated by sporadic Neolithic to Bronze Age burial and ritual monuments... Former dispersed rural settlement of the medieval and post-medieval periods is represented by abandoned	The presence of the windfarm in an adjacent area will not affect the moorland character or Neolithic to Bronze Age burial and ritual monuments and abandoned house sites. An access track may just disturb the edge of one post-medieval house site.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP HL4; Overall Evaluation and Justification from LANDMAP HL40 & 41; Guidelines from LANDMAP GL28 & 29)	Nature of Effect
	house sites... **Overall Evaluation: Moderate** - Area of relatively empty marginal land of little clear historical value... **Guideline** - none	
MNTGMHL704 Trannon Moor Within ZTV	Enclosed moorland and marginal land on the hills west of Carno, with large straight-sided boundaries probably mostly of 19th-century date... Early settlement and land use indicated by complexes of Neolithic to Bronze Age upland burial and ritual sites in the northern and eastern parts of the area... The Roman road from Carno to Penycrocbren crosses the area... Later settlement and land use indicated by scattered medieval and post-medieval upland house sites and peat-cutting platforms... 20th-century windfarm development in the central part of the area... **Overall Evaluation: High** - Upland moorland with concentration of earlier prehistoric burial and ritual monuments which bring up it score **Guideline** - none	The presence of the windfarm in an adjacent area will not affect the historic character created by the marginal nature of the land, Neolithic to Bronze Age upland burial and ritual sites and the Roman road from Carno to Penycrocbren.
MNTGMHL117 Mynydd y Cemmaes	Enclosed moorland and marginal land on upland ridges north-west of Llanbrynmair, now partly superimposed by 20th-century windfarm, with straight-sided 19th-century boundaries... Isolated blocks of 20th-century conifer plantation... Early settlement and land use indicated by clusters of Neolithic to Bronze Age burial mounds and by scattered prehistoric house sites... Later settlement and land use indicated by abandoned medieval and post-medieval house sites... **Overall Evaluation: Moderate** - area of mostly unenclosed upland with some forestry... Typical range of upland historic features - scattered prehistoric funerary monuments and evidence of post medieval agriculture - but no particular focus **Guideline -** none	The presence of the windfarm in an adjacent area will not affect the historic character created by the marginal nature of the land, Neolithic to Bronze Age burial mounds, scattered prehistoric house sites and abandoned medieval and post-medieval house sites.
Classification Level 3: Woodland		
MNTGMHL790 Carnedd y Cylch 1 turbine, and access track to the turbine and a borrow pit lie in this area	Extensive 20th-century hilltop and hillslope conifer woodland and felled woodland... Early settlement and land use is indicated by scattered Neolithic to Bronze Age hilltop burial mounds and abandoned post-medieval house sites...	This area will contain one turbine, track and borrow pit – these will be located within conifer woodland and no early prehistoric burial sites will be affected.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP HL4; Overall Evaluation and Justification from LANDMAP HL40 & 41; Guidelines from LANDMAP GL28 & 29)	Nature of Effect
	Overall Evaluation: Low - Area of afforested marginal land... Some early prehistoric burial sites recorded but apart from this minimal pre-forestry landscape little else is apparent. **Guideline** – none	
Classification Level 3: Irregular Fieldscapes		
MNTGMHL352 Upper Banwy Two temporary compounds, access tracks and a borrow pit lie in this area. Part of offsite access route also passes through this area.	Irregular fieldscapes in the valley of the upper Banwy and its tributaries west of Llanerfyl and on the enclosed hill land and hill slopes surrounding them... Sinuous, relict ancient broadleaved woodland along steeper valley sides... Early settlement and land use indicated by grouped and more dispersed Neolithic to Bronze Age burial and ritual monuments and by the small later prehistoric hillforts at Dol Hywel, Gogerddan and Lymystyn... Small nucleated church settlement of probably early medieval origin at Llanerfyl and small post-medieval settlement at Foel a little distance away from its possible medieval predecessor, near the medieval church at Garthbeibio... Dispersed farms and cottages of post-medieval date, and occasional post-medieval water corn mills... Small, modern holiday caravan parks... **Overall Evaluation: High** - Extensive area of irregular fieldscape dominated by medieval and later agricultural remains, but also significant for medieval and later settlements, a large number of prehistoric funerary and ritual monuments and a scatter of later prehistoric settlement sites... Scores highly because its size allows it a high (albeit unfocussed) historical content... **Guideline** – none	The compounds will be temporary features. The access tracks, one borrow pit and offsite access route will not affect the character of this extensive area of irregular fieldscape and no medieval and later settlements, prehistoric funerary or ritual monuments, or later prehistoric settlement sites will be affected.
MNTGMHL768 Afon Laen / Nant Twmyn Part of offsite access route passes through this area	Irregular fieldscapes in the valley bottom and lower hillslopes of the Afon Laen and Nant Twmyn valleys near Llanbrynmair... Early land use and settlement is indicated by a group of Neolithic to Bronze Age burial mounds in the Staylittle area and by chance finds... The Roman road between the forts at Caersws and Pennal runs through the area... Dispersed farmsteads of later medieval and post-medieval origin,	The minor road upgrades along the offsite access route and the presence of the windfarm in an adjacent area will not affect the historic character created by irregular fieldscapes, Neolithic to Bronze Age burial mounds, the Roman road between the forts at Caersws and Pennal or the small nucleated settlements of medieval origin, or watermills.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP HL4; Overall Evaluation and Justification from LANDMAP HL40 & 41; Guidelines from LANDMAP GL28 & 29)	Nature of Effect
	with small nucleated settlements of medieval origin at Llan and Talerddig and of post-medieval origin at Bont Dolgadfan, Llanbrynmair and Staylittle... Post-medieval industry is represented by watermills for corn and wool processing... 20th-century conifer plantations on some of the steeper hill slopes... **Overall Evaluation: Moderate** - Irregular fieldscapes in the valley bottom and lower hillslopes of the Afon Laen and Nant Twmyn valleys Dominated by medieval and later agriculture with numerous farms and houses and minor medieval settlements with churches, but also some earlier prehistoric burial and ritual monuments... Diffuse... **Guideline** - none	
MNTGMHL559 Allt Fawr Within ZTV	Irregular fieldscapes of medieval to post-medieval origin in the valley bottom of the river Garno, extending up the edge of the surrounding unenclosed and enclosed moorland... Discrete block of 20th-century conifer plantation with possibly residual broadleaved woodland in some steep-sided stream valleys... Later prehistoric land use and settlement indicated by the Castell Carno hillfort... The course of the Roman road between the Roman forts at Caersws and Pennal runs through... Small, nucleated post-medieval settlements at Clatter and Pontdolgoch... Dispersed farmsteads, houses and cottages of later medieval to 18th-century origin... **Overall Evaluation: High** - Highly distinctive area of small irregular fields occupying the rising ground around of the upper Garno... A post medieval and earlier agricultural landscape with scattered underlying prehistoric interest **Guideline** - none	The presence of the windfarm in an adjacent area will not affect the distinctive small irregular fields or underlying prehistoric interest.

Table 9: Effects on Cultural Landscape aspect areas within 5km (directly affected or within ZTV)

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP CL17; Overall Evaluation and Justification from LANDMAP CL40 & 41; Guidelines from LANDMAP CL23 and/or 24)	Nature of Effect
Level 3 Classification: Rural		
MNTGMCL051 Rural Landscapes All 30 turbines and access tracks, substation, borrow pits, batching plant and all but one temporary compound lie in this area	The Aspect Area is essentially a catch-all of landscapes surrounding other Aspect Areas... It reveals an eclectic mix of landscape type, from fertile lowlands to bleak moorlands, and forms a buffer between other Aspect Areas that are more culturally distinctive or diverse... Surprisingly, there are few statutorily protected landscape types - such as SSSIs or SLAs within the area... Nevertheless, Rural Landscapes forms the background to the more detailed painting on the canvas of Montgomeryshire, contributing greatly to the county's soubriquet of Powis paradwys Cymru.... **Overall Evaluation: High** as a varied, visually rich rural landscape of a wide topographical range that provides the framework for the Study Area as a whole. **Guideline: Immediate** Seek more imaginative means of keeping young people closer to the land and their roots by encouraging regenerative or small business activity in this age of the world wide web and e-commerce **Medium Term** Seek to ensure sustainability of income and provide subsidy to retain people so that they may nurture the landscape **Long Term** Provide grants and/or subsidies for the maintenance of structures in the landscape	The proposed development will alter the rural landscape that "forms the background to the more detailed painting on the canvas of Montgomeryshire" in a localised area It may be seen by some as adversely affecting the rural landscape, while it may be seen by others as contributing to the visually rich rural landscape. The project will ensure regular income to a number of farms and landowners for the life of the project in line with the objective to ensure sustainability of income. It will not affect other cultural aspects of the landscape.
MNTGMCL053 Llanbrynmair Within ZTV	The parish and village of Llanbrynmair stands astride Wales's main north-south road (A470) and through it passes the "rat-run" minor road B4518 via Clywedog and Staylittle... The original settlement of Llan gave its name to the longer name of Llanbrynmair at the coming of the 19th century turnpike road through the then hamlet of Wynnstay... The parish contain a number of small settlements, in addition to the attractive hilltop Llan, which show evidence of	The presence of the windfarm in an adjacent area will not affect the cultural character of this area.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP CL17; Overall Evaluation and Justification from LANDMAP CL40 & 41; Guidelines from LANDMAP CL23 and/or 24)	Nature of Effect
	occupation and evolution over many centuries and which contain much of their original character... The influential champion of rural vernacular buildings, Iorwerth Peate, was born in the parish... The character of the larger settlement of Llanbrynmair has been compromised by "bungaloid" growth built of plain, boring and inappropriate materials and to an especially dull design. **Overall Evaluation: Moderate** because of undistinguished modern development having been permitted. **Guideline: Medium Term** Planners should consider using their powers to insist on more appropriate use of materials and site design for any future developments.	
Classification Level 3: Places		
MNTGMCL044 River Valleys One temporary compound lies in this area. Part of offsite access route also passes through this area.	These eastward-trending river valleys dominate the landscape of Montgomeryshire... Their streams mostly flow from Pumlumon, Berwyn and lesser ranges... They are variously broad or steepsided (or both) and contain most of the historic settlements in the middle and north of the Study Area as a result of being the most convenient terrain for communications routes (except those in such Aspect Areas as MONTSCL001 - River Severn; MONTSCL003 - Vyrnwy River Valley; MONTSCL015 - Tanat Valley; MONTSCL016 - Clywedog Valley)... They are chosen as a single Aspect Area not because of the similarity of their topography (which differs markedly) but because of the evidence of long-term settlement and exploitation of the adjacent terrain caused by topography... Without exception, each displays more than average aesthetic qualities... Many of the settlements within them have been selected as Aspect Areas in their own right - and these valleys provide the wider cultural context for them. **Overall Evaluation: High** as typifying the cultural variety in the river valley landscapes of the middle and northern parts of the Study Area. **Principal management recommendations** - Apply planning regulations more stringently on the	The presence of one temporary compound and upgrades to the access route will not affect the cultural character of this area, a landscape of valleys that contain historic settlements and communication routes.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP CL17; Overall Evaluation and Justification from LANDMAP CL40 & 41; Guidelines from LANDMAP CL23 and/or 24)	Nature of Effect
	design and scale of new build.	

1.2.2 For the purposes of the Visual and Sensory layer, CCW's overall evaluation has been used as a proxy for sensitivity (areas with a High or Outstanding evaluation are categorised as being of High sensitivity, aspect areas having an overall evaluation score of moderate are judged to be of medium sensitivity and those with an overall evaluation score of low are judged to be of low sensitivity). This accords with the approach undertaken in the second SEI (2011).

Table 10: Effects on Visual & Sensory aspect areas within 10km (directly affected or within ZTV)

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
Level 3 Classification: Wooded Upland & Plateaux		
MNTGMVS320 Banwy Forest 14 turbines, access tracks to these turbines, three borrow pits and the substation lie in this area	A large and extensive area of blanket forestry dominating the upland area between the Banwy and Tafalog/Rhiwsaeson valley systems...Visually dominant and in extreme contrast to the open upland grazing and rolling farmland that forms the wider landscape context.... **Overall Evaluation: Low** - Large scale coniferous afforestation blankets the subtleties of the underlying landform and produces intrusive conifer fringes and harsh plantation edges into an otherwise open expanse of upland moorland and grazing, little/no public access **Guideline: Medium Term** Diversify with broadleaf native species to visually integrate and widen appeal **Medium Term** Improve public access **Medium Term** Break up regular straight edges to planting - feather forestry edge to follow landform and improve species diversity **Low sensitivity**	This area will be directly affected by 13 turbines and tracks, three borrow pits and the sub-station resulting in a high magnitude of change to the character of the site (within the red line boundary) changing the site from forestry/grassland to forestry/grassland with a wind farm generating energy. Although the area is of low sensitivity, the high magnitude of change means this effect is judged to be **major** on the site within the red line boundary. This effect on landscape character will not extend beyond the boundary of the site due to the forested nature of the landscape. **Long-term**
MNTGMVS500 Dyfnant Forest Within ZTV	Large and extensive block of mixed age coniferous plantation and forestry with a distinct path network and public access throughout... Broad areas of clear felling create desolate open areas in contrast to the blanket single species planting elsewhere within the aspect... Isolated pockets of cultivated small scale farming make a welcome	There will be no development in this aspect area. Although there will be theoretical visibility from this aspect area within 5-10km, it is heavily wooded and therefore in reality there would be few opportunities for views of the turbines, except for from clear felled areas where there would be a low magnitude of change to visual and

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	contrast to the mass planting. **Overall Evaluation: Moderate** - In contrast with some of the other forestry areas within the study area opportunities have been taken to modify the forestry management through smaller scale more irregular compartment felling, further opportunity should be taken to diversify species type and feather forestry edge to emphasis the underlying topography. **Guideline** **Immediate** Promote and encourage public access **Medium Term** Break up regular straight edges to moorland edge - "feather" forestry to follow landforms **Medium Term** Further planting should integrate with existing topography - expose peaks, rock outcrops and local features **Medium Term** Clear felled areas provide opportunity to diversify species type - introduce more broadleaf species to lower lying areas. **Medium sensitivity**	sensory aspects of landscape character. The presence of turbines in an adjacent aspect area will not alter the key visual and sensory characteristics of this aspect area, or affect the 'attractive views' to the Snowdonia National Park (as noted in the Collector Record for this aspect area). **Minor** effect on visual and sensory aspects of landscape character. **Long-term**
MNTGMVS694 Carno Uplands Within ZTV	A relatively small area of upland to the north of Carno which forms the visual backdrop to both the settlement and Carno valley itself. A series of rounded peaks -Allt Fawr, Cryniarth and Yr Allt-rising in places to 450 metres AOD. The openness is somewhat compromised by the presence of large blocks of conifer plantations with hard often angular edges which pay little respect to landform and landscape character. The area is dissected by a number of	There will be no development in this aspect area. The nearest part of this aspect area with theoretical visibility of turbines is 5km from the Proposal. From open hillsides between 5 and 10km there will be views of turbines which will result in a low magnitude of change to visual and sensory aspects of landscape character. The presence of turbines in an

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	streams and small watercourses inc. Nant Cwmgerwyn. **Overall Evaluation: Moderate** - Typical of much of the area with open heath and moor adversely affected by conifer plantations. **Guideline** **Long Term** Look to soften edges of plantations. **Long Term** Increased impact of windfarms. **Medium sensitivity**	adjacent aspect area will not alter the key characteristics of this aspect area (including its role in the visual backdrop to Carno). **Minor** effect on perceptual character. **Long-term**
MNTGMVS293 Esgair Geulan Within ZTV	Relatively small coniferous woodland overlying a steeply contoured upland and surrounded by open upland grazing... Single species mass planting with little age or species diversity, the area creates a harsh image at odds with the landform and surrounding open or managed landscape types. **Overall Evaluation: Moderate** - Single species mass planting of forestry that is more easily integrated into the landscape due to its relatively small size, also benefits and borrows from the adjacent aspect areas of higher aesthetic quality. **Guideline** **Medium Term** Encourage replanting with broadleaf and deciduous species Medium Term Take advantage of felled compartments to open up views and expose landform - rock exposure etc **Medium Term**	There will be no development in this aspect area and there will be theoretical visibility from only a small part of this aspect area at almost 10km away – in addition, the area is heavily wooded which restricts views out. It is therefore judged that the presence of the Proposal will result in an imperceptible change to visual and sensory aspects of landscape character. **Negligible** effect

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Encourage public access and interpretation **Medium sensitivity**	
Classification Level 3: Mosaic Upland & Plateaux		
MNTGMVS264 Banwy Upland 11 turbines, access tracks, two borrow pits, a temporary compound and the temporary batching plant lie in this area	The continuation of the upland plateau and ridge that carries the extensive forestry of the Banwy Forest - upland grazing with a mosaic of heather/bilberry scrub and marginal rough grazing with intermittent small forestry blocks... Open and extensive views to the surrounding successive upland ridges and into the Dyfi Valley Catchment... Marginal, remote with wide open skies and relative lack of human traffic/intervention. **Overall Evaluation: Moderate** - Mosaic upland that would benefit greatly from diversification of existing forestry blocks and introduction of broadleaf / deciduous species to plateau edges. **Guideline: Medium Term** Improve species diversity for forestry blocks - introduce mixed broadleaf and deciduous species **Medium Term** Control invasive bracken and gorse growth **Long Term** Restore / reintroduce moorland element into vegetative cover to areas adjacent forestry blocks **Medium Term** Introduce intermittent broadleaf tree cover to plateau edges emphasising landform and valley courses. **Medium sensitivity**	This area will be directly affected by 11 turbines and tracks and two borrow pits (as well as temporary compound and batching plant) resulting in a high magnitude of change to this aspect area (see VP3 which looks towards this aspect area). Nevertheless, the key visual and sensory characteristics of the area which include the open and extensive views to the surrounding successive upland ridges and into the Dyfi Valley Catchment will remain. It is predicted that the operational wind farm will result in a high magnitude of change to the character of the site (within the red line boundary) changing the site from upland grazing with small forestry blocks to upland grazing with small forestry blocks and a wind farm generating energy. Taking account of the medium sensitivity of the landscape and the high magnitude of change this effect is judged to be major on the site itself within the red line boundary. This effect on landscape character will extend beyond the boundary of the site, affecting the majority of this aspect area (see **Figure 4.9**). However, the characterising influence will decline with distance and overall the effect on the Banwy Upland Aspect Area is judged to be **moderate** taking account of the medium sensitivity of the landscape and the geographic extent of the characterising effect which extends across the majority of the aspect area.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
		Long-term
MNTGMVS363 Newydd Fynyddog Within ZTV	A transitional landscape between the open and exposed moorland of the Trannon Moors and the more domesticated hill slopes mosaic grazing leading into the Dovey Valley... Largely weakly enclosed marginal grazing land with an area of small scale irregular fields associated with a farm settlement to the centre of the area... Clear and extensive views are available over the Trannon Moors and to the wind farm south of the aspect and over the small scale well enclosed farming land River Dyfi catchment area to the north... Borderline wilderness due to the weak enclosure and vegetation type... Open, exposed, wide open skies dominate most of the area. **Overall Evaluation: Moderate** - Upland area with dramatic visual link to the upland moorland of the Trannon Moors, however some forestry blocks and the extensive development of the Trannon Windfarm degrades this visual appreciation of the area. **Guideline** **Medium Term** Strengthen field boundaries within the small scale field patterns adjacent Hafodwen. **Long Term** Maintain existing balance between open weakly enclosed rough grazing and small scale sheltered fields. **Medium sensitivity**	There will be no development in this aspect area. The nearest part of this aspect area with theoretical visibility of turbines is 2.7km from the Proposal. From open hillsides between 2.7 and 7.5km there will be views of turbines. However, the characteristing effect will only extend to about 3km from the turbines, resulting in a medium magnitude of change to perceptual character of the very northern tip of this aspect area. The characterising effect will reduce with distance, and the key visual and sensory characteristics listed opposite will remain. 1.1 Noting the medium sensitivity of the area and the medium magnitude of change, this will result in a **Moderate** effect on the northern extremity of the LCA within about 3km. There will be no significant effects beyond this. **Long-term**
Classification Level 3: Upland Grazing		
MNTGMVS571	A relatively narrow band of higher level upland grazing that forms a break between the Banwy and Dovey	This area will be directly affected by 5 turbines, associated tracks and a borrow pit resulting in a high

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
Pen Coed Upland 5 turbines, tracks and a borrow pit lie in this area	Valley catchment areas... Its form is more apparent due to the course that the A548(T) takes over the highest level before dropping down into the Dovey Valley and joining with the A470(T)... Rough grazing semi improved with damp marshy grazing in places and isolated blocks of forestry on upper slopes, extensive livestock grazing weakly enclosed with an upland backdrop of forestry and moorland... **Overall Evaluation: Moderate** - A subsidiary area of a larger upland grazing complex associated with the extensive upland moorland regions on the western borders of Montgomeryshire and Gwynedd - this area is the east west watershed between the main watercourses that make up the study area but is dominated by the extensive upland ranges north and south and contains the busy A458(T) transport corridor. **Guideline: Medium Term** Control bracken and gorse growth **Medium Term** Ensure forestry plantation integrates with existing landform and contains percentage of broadleaf species. **Medium sensitivity**	magnitude of change to this aspect area (see VP6 which looks towards this aspect area). Nevertheless, the key visual and sensory characteristics of the area which include the extensive livestock grazing and isolated blocks of forestry will remain. It is predicted that the operational wind farm will result in a high magnitude of change to the character of the site (within the red line boundary) changing the site from upland grazing to upland grazing with a wind farm generating energy. Taking account of the medium sensitivity of the landscape and the high magnitude of change this effect is judged to be **major** on the site itself within the red line boundary. This effect on landscape character will extend beyond the boundary of the site. The characterising effect will extent to approximately 3km, affecting Pen Coed itself (see Figure 4.9). The magnitude of change to the visual and sensory character of this area within 3km of the turbines is judged to be medium. Taking account of the sensitivity of the landscape the effect on this localised area of Pen Coed is judged to be **moderate**. **Long-term**
MNTGMVS733 Esgair Cwmowen Uplands Within ZTV	An extensive area of upland grazing with a patchwork vegetation cover of rough grazing, heather and bracken, irregular field patterns running with the topography and intermittent small blocks of coniferous and mixed woodland... Exposure and wind are dominant features with isolated more intimate areas with small irregular hedged fields in sheltered areas to the edge of the area.	There will be no development in this aspect area and there will be no change to the patchwork upland grazing or field patterns for which the area is valued. There will be patchy visibility of the turbines from the area - the nearest part of this aspect area with theoretical visibility of turbines is 1.8km from a turbine.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Overall Evaluation: High - Good example of patchwork upland grazing that is characterised by the field patterns and land use emulating the topography. **Guideline** **Medium Term** Manage bracken to maintain existing balance of agricultural practices. **High sensitivity**	From open hillsides between 1.8km and 10km there will be views of turbines which will affect perceptual character. However, the magnitude of change will reduce with distance from the development and any perceived change will be restricted to places from where there is visibility. It is anticipated that the operational wind farm will result in a medium magnitude of change to perceptual character in the far north-west of the aspect area, up to about 3km from the turbines, and the remainder of the area will experience a low or imperceptible magnitude of change. **Moderate** localised effect on the north-west part of the area. **Long-term** No significant effects on visual and sensory aspects of landscape character beyond this.
MNTGMVS796 Rhiw Goch Within ZTV	Area of upland grazing with weakly enclosed marginal and unimproved grazing with isolated blocks of forestry and predominantly single species planting that follow the drainage patterns and valleys leading over the plateau edge... Clear and aesthetic views over the surrounding traditionally farmed landscape of the Dyfi Valley mosaic. **Overall Evaluation: Moderate** - Upland grazing with small woodland blocks that would benefit from species diversification and modification to follow the existing landform... Dramatic views over the Dyfi Valley but suffers from some visual degradation through the proliferation of forestry plantation.	There will be no development in this aspect area. There will be patchy visibility of the turbines from the area - the nearest part of this aspect area with theoretical visibility of turbines is over 5km from a turbine. From open hillsides between 5km and 10km there will be views of turbines which will affect perceptual character. However, the magnitude of change will reduce with distance from the development and any perceived change will be restricted to places from where there is visibility. It is anticipated that the operational wind farm will result in a low

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Guideline **Immediate** Improve species diversity of forestry blocks - introduce broadleaf species. **Medium Term** Control invasive bracken and gorse scrub. **Medium sensitivity**	magnitude of change to the visual and sensory character of parts of this aspect area and the remainder of the area will experience an imperceptible magnitude of change. Dramatic views over the Dyfi Valley will be retained. **Minor** effect on parts of the aspect area within the ZTV. **Long-term**
Classification Level 3: Hillside & Scarp Slopes Mosaic		
MNTGMVS422 Llanerfyl Mosaic Farmlands Some access tracks in this area – also part of the offside access passes through this area (including the track by passing Neinthirion)	Distinct area typical of the mid regions of Montgomeryshire of small scale irregular fields patterns with very strongly defined field boundaries typified by overgrown and managed hedgerows with a significant proportion of mature hedgerow trees... Small to medium sized mixed broadleaf woodland is common in lower lying areas and especially found along watercourses... A succession of low rolling hills with gently sloping sides and rounded tops underlying a very traditional farming landscape - high aesthetic qualities, settled, domestic setting. **Overall Evaluation: High** - Well defined example of a traditionally farmed landscape, small scale field patterns with a diverse vegetation cover of hedgerows with hedgerow trees, mixed broadleaf woodland parcels... High aesthetic qualities and limited intrusion by modern development. **Guideline: Medium Term** Encourage further use of traditional land management techniques ie	Some access tracks are located in this area and part of the proposed offsite access route passes through this area between Llanerfyl and the southern entrance to the site which will result in some localised change to the character of the road that will persist into the operational phase, including a new reinforced grass track around Neinthirion. However, the character of the wider area will remain unchanged. There will also be effects on the perceptual character of the landscape as a result of views of the turbines, particularly from the Eira Valley adjacent to the site (see VP2, 4, 5, and 6). It is anticipated that the operational wind farm will result in a medium magnitude of change to a localised part of this Aspect Area up to about 3km from the turbines (i.e.in the Eira Valley).

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	hedge laying / coppicing **Long Term** Phased replanting of hedgerow boundaries to maintain existing character **Medium Term** Control new development in association with farm settlements integrate with existing landscape pattern **High sensitivity**	 **Moderate** effect immediately surrounding the site (i.e.in the Eira Valley). **Long-term**
MNTGMVS278 Pont Llogel Farmlands Within ZTV	An extensive area that in conjunction with the hill and scarp mosaic of Llanfyllin and Guilsfield is typical of the rolling traditional farmland of Mid Montgomeryshire... Strongly defined field pattern that follows the underlying topography, small scale, irregular field parcels spreading over a succession of rolling ridges... Locally, hilltop grouped trees and marshy un or semi improved damp grazing is common... Wooded areas congregate around watercourses and follows small scale valleys to the edges of the area... Domestic, settled character with traditional land management techniques such as hedge laying and coppiced woodland areas. **Overall Evaluation: High** - Needs to be read in conjunction with the hill and scarp mosaic areas adjacent to Llanfyllin and Guilsfield as a part of the dominant landscape type for Mid Montgomeryshire, a traditional farming landscape that is under economic pressure to modernise farming practices that may degrade the existing character. **Guideline** **Long Term** Encourage medium to long term replanting of hedgerow boundaries and employ traditional management	Part of this aspect area falls between 5 and 10km of the Proposal. Although there will be some views of the Proposal from this area (e.g. VP13), any change to perceptual character will be of low magnitude and the key visual and sensory characteristics referred to in LANDMAP will be retained (including the strongly defined field pattern over a succession of rolling ridges for which it is particularly valued). **Minor** localised effect on visual and sensory character. **Long-term**

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	practices **Long Term** Maintain mosaic of small scale field patterns **High sensitivity**	
MNTGMVS764 Newydd Fynyddog Mosaic Hillside Within ZTV	Area of hillside semi improved grazing that forms the transitional landform between the upland moorlands and unimproved grazing of the Plinlimon Moors and the fertile farmlands of the Dyfi floodplain... Small to medium scale irregular field patterns bounded by a mixture of boundary treatments - predominantly well defined and overgrown hedgerows with associated mixed woodland patches. **Overall Evaluation: High** - Forms part of a rich mosaic traditionally farmed grazing land that spreads form the mosaic uplands above towards the fertile Dyfi Valley lowlands, High aesthetic appeal and borrows much from the aesthetic appeal of the surrounding aspects. **Guideline** **Medium Term** Encourage adoption and proliferation of traditional farming practices such as hedge laying **Medium Term** Improve species diversity concentrating on mixed broadleaf, oak and beech woodland. **High sensitivity**	There will be no development in this aspect area. There will be patchy visibility of the turbines from the northern part of this area only (the nearest part of this aspect area with theoretical visibility of turbines is 2.6km from a turbine) which will affect perceptual character. However, the magnitude of change will reduce with distance from the development and the majority of the aspect area will be unaffected. It is anticipated that the operational wind farm will result in a medium magnitude of change to visual and sensory aspects of landscape character in the northern part of this aspect area and the remainder of the area will experience an imperceptible magnitude of change. The rich mosaic of traditionally farmed grazing land for which this aspect area is particularly valued will be retained. **Moderate** effect on the northern part of this aspect area, no effect on the remainder. **Long-term**
MNTGMVS460 Clegyrnant Grazing	Narrow valley of irregular and well wooded field patterns - fields are small to medium in size with well defined and distinct field boundaries giving the appearance of a traditional and well maintained	There will be no development in this aspect area. There will be patchy visibility of turbines from the western slopes of the valley (turbines will be 1.8km

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
Within ZTV	farming landscape... Enclosed views due to the steeply rising upland plateau areas to the west and east provides an intimate and domestic scale and reminiscent of "lost valley". **Overall Evaluation: High** - High proportion of mixed woodland parcels and well defined hedgerow boundaries with steeply valley sides emphasises the traditional and aesthetically pleasing farming landscape and "lost valley" sense of place. **Guideline** **Medium Term** Encourage phased replanting of mixed woodland blocks and parcels **Medium Term** Encourage / proliferate use of traditional land management techniques ie hedge laying and coppicing. **High sensitivity**	away at their closest point). However, only tips will be visible from most of the area with theoretical visibility and at least half the aspect area will have no visibility. The traditional and aesthetically pleasing farming landscape for which this aspect area is particularly valued will be retained. Any change will be no greater than low in magnitude. Although this area has a high sensitivity, the imperceptible to low magnitude of change means that change to visual and sensory character is judged to be **Minor**. **Long-term**
MNTGMVS441 Cemmaes Scarp Within ZTV	Steeply undulating and rising hillsides slopes preceding the upland area of Mynydd y Cemmaes and its windfarm... Traditionally farmed landscape with small scale field patterns reflecting the underlying landform and displaying a well defined pattern with hedgerows and hedgerow trees the dominant landscape feature... Some incidental mixed woodland patches largely following lower lying areas and watercourses... Settled and domesticated landscape that would benefit from a higher proportion of mixed woodland parcels to emphasise the landform... Relatively good clear views available from with much of the area over the rolling mosaic farmland of the Dyfi Valley and towards the rising upland hinterland of the SNP to the west and north.	There will be very little visibility from this area – views from the area are directed west and north. **Negligible** effect.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Overall Evaluation: Moderate - Aspect would benefit from enrichment planting with mixed broadleaf woodland to reflect landform and the undulating valley forms dropping down from the adjoining upland plateau... Generally an aesthetically pleasing and traditional farmed landscape that borrows from the high visual qualities of its adjacent aspects and is read as a part of the Dyfi Valley complex as a whole rather than individually. **Guideline** **Medium Term** Encourage mixed broadleaf woodland planting to lower lying areas and in association with field boundaries **Medium Term** Encourage / introduce traditional land management techniques ie... hedge laying. **Medium sensitivity**	
Classification Level 3: Hillside & Scarp Slopes Grazing		
MNTGMVS493 Dyfi Valley Rolling Grazing Within ZTV	An extensive area of hillside semi improved grazing that forms the transitional landform between the upland moorlands and unimproved grazing of the Plinlimon Moors and the fertile farmlands of the Dyfi floodplain... Small to medium scale irregular field patterns bounded by a mixture of boundary treatments - gappy hedgelines and fences some limited examples of stone walling at upper levels... Numerous scattered farmsteads and small clustered settlements based on extensive and traditional farming practices. **Overall Evaluation: Moderate** - An extensive and good example of hillside grazing and a traditionally farmed landscape that would benefit from enrichment planting of woodland parcels and strengthening	There will be no development in this aspect area. There will be visibility of the turbines from the north and east facing slopes (the nearest part of this aspect area with theoretical visibility of turbines is 4km from a turbine) which will affect visual and sensory aspects of landscape character. However, the magnitude of change will reduce with distance from the development and other parts of the aspect area will be unaffected. It is anticipated that the operational wind farm will result in a low magnitude of change to visual and sensory aspects of landscape character of small isolated areas of this aspect area. The remainder of the area will experience an

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	of field boundaries. **Guideline** **Medium Term** Encourage replanting and enrichment planting to strengthen field boundaries **Medium Term** Improve species diversity in woodland parcels with greater range of broadleaf and deciduous species **Medium Term** Encourage adoption of traditional farming techniques such as hedge laying. **Medium sensitivity**	imperceptible magnitude of change. The traditionally farmed landscape for which this aspect area valued will be retained. **Minor** effect in small isolated areas. **Long-term**
MNTGMVS337 Cwm Tafalog Within ZTV	A narrow valley formed by the steeply sided plateau ridges of the Mynydd Lluest Fach and Mynydd y Cemmaes... Traditional farming landscape with irregular field patterns and diverse vegetation cover with semi improved and marginal grazing with the valley slopes displaying rough grazing, bracken and gorse scrub... Enclosed, remote in part due to the steep landforms on either side that cut off the outer world - "lost valley" sense of place. **Overall Evaluation: Moderate** - Small and intimate scale traditionally farmed landscape that would benefit from enrichment planting of mixed broadleaf woodland parcels, due to its confined topographic form can also be quite oppressive in poor / dull weather. **Guideline** **Medium Term** Improve hedgerow boundaries in valley floor to strengthen field	There will be no development in this aspect area. There will be visibility of the turbines from the east facing slopes (the nearest part of this aspect area with theoretical visibility of turbines is just over 2km from a turbine) which will affect perceptual character. However, the magnitude of change will reduce with distance from the development and the majority of the aspect area will be unaffected. It is anticipated that the operational wind farm will result in a medium magnitude of change to visual and sensory aspects of landscape character of the southern extremity of this aspect area which falls within about 3km of the Proposal. The remainder of the area will be experience no greater than a low magnitude of change, or be unaffected. The traditionally farmed landscape for which this aspect area valued will be retained.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	pattern **Medium Term** Encourage proliferation of mixed woodland blocks to valley floor and sides **Medium Term** Control invasive bracken and gorse growth. **Medium sensitivity**	**Moderate** localised effect on the visual and sensory aspect of landscape character of high ground in the southern extremity of this area. **Long-term**
Classification Level 3: Flat Open Lowland Farmland		
MNTGMVS119 Banwy Floodplain Within ZTV	Relatively narrow and steepsided valley system with an open valley floor of well defined small to medium scale field pattern associated with the Afon Banwy... Predominantly semi improved grassland with a proportion of damp pasture land associated with the river course... Damp woodland also a strong characteristic of the area... Transport corridor A458 (T) principal east west route between Welshpool and SNP linking with the A470 (T). **Overall Evaluation: Moderate** - Narrow river corridor with dispersed small to medium settlements dominated by the surrounding steep valley sides, lower slopes and valley bottoms tend to carry the main arterial transport routes through the study area and detract from the overall aesthetic quality of the aspect... The open flat valley bottoms and proximity to arterial transport routes make the area vulnerable to larger scale development that may be out of keeping with the landform and existing field pattern. **Guideline** **Medium Term** Encourage medium to long term replanting of hedgerow boundaries - employ traditional land management	There will be no development in this aspect area. The ZTV shows theoretical visibility of turbines from part of this valley, although most will be affected by tips only and presence of ground level vegetation means that in practice the turbines are likely to go unnoticed from most parts of the valley. There may be some visibility from distances of around 7km but at this distance any change to visual and sensory character would be imperceptible. The fundamental characteristics for which this valley is valued, as listed in the Collector Record, will be retained. **Negligible**

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	practices ie hedge laying **Medium Term** Limit further expansion of new development especially caravan parks - should be small scale and fit with existing field patterns and landform. **Medium sensitivity**	
Classification Level 3: Upland Moorland		
MNTGMVS368 Berwyn Uplands Within ZTV	A very broad extensive area of upland moorland plateau on the edge of the Snowdonia National Park... The aspect is very strongly linked visually to the SNP with the moorland plateau taking on the characteristic of upland peak hinterland... Open, exposure and wide open skies dominate with heather/bilberry and rough grazing predominant and bracken growth to lower plateau sides...Some upland lakes area evident with a number of large boggy areas in lower lying and poorly drained areas. **Overall Evaluation: High** - Extensive dramatic and high aesthetic quality long distance views out towards the SNP and Berwyn mountains coupled with the high/outstanding quality of the habitat are tempered by the views within the aspect tending to be more monotone in the broad expanse of gently rolling upland and degraded in places by the broad expanses of upland coniferous plantation that sit at odds with the overall open moorland character of the area. **Guideline** **Medium Term** Limit expansion of coniferous forestry plantations.	There will be no development in this aspect area. There will be patchy visibility of the turbines from the area - the nearest part of this aspect area with theoretical visibility of turbines is just under 5km from a turbine. From open hillsides between 5km and 10km there will be views of turbines which will affect perceptual character. However, the magnitude of change will reduce with distance from the development and any perceived change will be restricted to places from where there is theoretical visibility. It is anticipated that the operational wind farm will result in an imperceptible magnitude of change to visual and sensory character. The Proposal will not affect the long distance views out towards the SNP and Berwyn mountains. **Negligible**

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	High sensitivity	
MNTGMVS179 Trannon Moors Within ZTV	An isolated area of upland moorland more usually found to the southern and western borders of the study area...Open, exposed and wide open skies dominate with heather/bilberry and rough unimproved grassland predominant with bracken and gorse growth to lower edges adjacent upland grazing... An extensive wind farm development dominates the central and southern half of the area and provides a dramatic feature in an otherwise open but dramatic landscape. **Overall Evaluation: Moderate** - Upland moorland that suffers from some degradation due to the extensive forestry adjacent to the south and extensive wind farm development. **Guideline** **Medium Term** Limit further wind farm development **Medium Term** Control bracken and gorse growth. **Medium sensitivity**	There will be no development in this aspect area. There will be patchy visibility of the turbines from upper hillsides in this area (see VP 14) – these views will also be over 5km from the turbines and the Proposal will not affect the upland moorland for which the area is particularly valued. **Negligible**
MNTGMVS147 Mynydd Lluest Fach Within ZTV	A distinct plateau landform bounded by the narrow valleys of the Afon Rhiwsaeson and Clegyrnant... The plateau is steep sided and displays a number of waterfalls falling from the watercourses draining it... Extensive area of marginal upland grazing and moorland... Open expose with dramatic clear views to the surrounding upland and into the adjacent wooded valleys. **Overall Evaluation: Moderate** - Some degradation to the aesthetic qualities of the aspect through proximity of Banwy Forest and the adjacent wind farm - although the wind farm provides a dramatic focal	There will be no development in this aspect area. There will be patchy visibility of the turbines from the eastern part of this aspect area – these views will be between 2.5km and 5km from the nearest turbines, affecting perceptual character. It is anticipated that the operational wind farm will result in a low magnitude of change to the visual and sensory character of the eastern part of this aspect area. The Proposal will not affect the upland moorland for which the area

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	point in its own right. **Guideline** **Medium Term** Discourage expansion of the forestry planting at Banwy Forest. **Medium sensitivity**	is particularly valued. **Minor** effect on the eastern part of this aspect area. **Long-term**
MNTGMVS413 Mynydd y Cemmaes Within ZTV	Large upland ridge/plateau area with steep sided valleys formed by the Dyfi valley to the west and the Afon Rhiwsaeson to the east... Dramatic and extensive clear views are available over the surrounding rolling lowland farmland of the Dyfi Valley and towards the rising upland and mountains of the SNP... Much of the exposed ridge is occupied by an extensive windfarm development that provides a strong visual focus for the surrounding westerly lowlands... Open, exposed and with a remote borderline wilderness air to the area it also forms an important topographic feature in forming part of the eastern boundary for the Dyfi floodplain catchment. **Overall Evaluation: High** - Wind turbines provide a contrasting visual experience and overall focus for the surrounding area that does not necessarily degrade or detract from the aesthetic quality - rather it complements it and provides for a unique experience. **Guideline** **Long Term** Prevent further expansion of the windfarm **Medium Term** Maintain existing minimal and marginal moorland upland grazing management **Medium Term**	This LCA is located just over 3km away from a turbine at its closest point. There will be views of the Proposal from the higher hillsides in this LCA (e.g. VP10). This will affect visual and sensory aspects of landscape character, although the effect will reduce with distance. The Proposal will not affect the views into the Dyfi Valley or towards the mountains of Snowdonia that are identified in the summary description in the Collector Record for this aspect area. It is anticipated that the operational wind farm will result in a low magnitude of change to perceptual character. **Minor** effect. **Long-term**

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Discourage further afforestation and encourage species diversity in existing forestry plantation. **High sensitivity**	
SNPVS105 Bwlch y Groes uplands Within ZTV	Upland moorland hills & valleys... Heather slopes add colour to green / brown dominant tone... Good weather borrowed views to Aran ridge and Arenig mountains... Scattered conifer plantations detract from moorland feel (e...g... at Foel Y Geifr) but overall sense of exposure... Strong sense of place derived predominantly with strong association with distinctive ridge line of Aran mountains... Distinct feeling of "arrival" when driven up from the east. **Overall Evaluation: High** - strong upland sense of place imparted by strong visual links with Aran ridge and general feel of exposure and altitude **Guideline** **Medium Term** forestry plantation. **High sensitivity**	There will be no development in this aspect area. There will be patchy visibility of the turbines from upper hillsides in this area but these views will be over 5km from the turbines and the Proposal will not affect the upland sense of place for which the area is particularly valued. **Negligible**
Classification Level 3: Hill & Lower Plateau Grazing		
MNTGMVS696 Carno Grazing Within ZTV of the turbines. Part of offsite access passes through this area.	A traditional livestock farming landscape with a strongly defined field pattern - managed hedgerow boundaries and small to medium sized field patterns are a signature element for the aspect... The area forms part of the A470(T) and rail transport corridor and as such is an important thoroughfare and tourist route attracting development ... Grazing types range from semi improved grassland to marginal grazing on the upper slopes... Settlements tend to be small, clustered and other than Carno in the centre of the area have few facilities... Some new development has taken place in the form of	Part of the proposed offsite access route including the Talerddig junction lies within this area which will result in some localised change to the character of the road that will persist into the operational phase of the wind farm. This will result in medium magnitude of change to a small part of the LCA at the site of the Talerddig junction. There will also be views of turbines, particularly from the A470 and adjacent hills (see VP9), but this will not result in a characterising effect

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	caravan parks and light industrial development that need careful design to integrate into the existing field patterns. **Overall Evaluation: Moderate** - typical traditional farming landscape of the mid and eastern extents of the study area exhibiting some degradation through pressure from development due to its proximity to the A470(T) transport corridor and tourist route to North Wales. **Guideline** **Medium Term** Encourage employment of traditional farming practices - hedge laying and coppicing **Immediate** Ensure new development is carefully integrated into existing landscape character - respect field patterns and vegetation cover **Medium Term** Enrich and strengthen field boundaries - additional hedgerow replanting where fields have been amalgamated. **Medium sensitivity**	on the landscape and the character of the wider area will remain unchanged. **Moderate** localised effect at the site of the Talerddig junction. **Long-term**
Classification Level 3: Hill & Lower Plateau Mosaic		
MNTGMVS235 Carno Mosaic Within ZTV	A traditional livestock farming landscape with well wooded and strongly defined field pattern - overgrown and managed hedgerow boundaries with intermittent grouped broadleaf trees a signature element for many of the boundaries... The area forms part of the A470(T) transport corridor and as such is an important thoroughfare and tourist route... Grazing types range from semi improved grassland to marginal grazing on the upper slopes... Settlements tend to be small, clustered and other than	There will be no development in this aspect area. There will be patchy visibility of the turbines from upper hillsides in this area – these views will be over 5km from the turbines and the Proposal will not affect the traditional farming landscape for which the area is particularly valued. **Negligible**

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Carno in the centre of the area have few facilities... Some new development has taken place in the form of caravan parks and campsites that need careful design to integrate into the existing field patterns. **Overall Evaluation: Moderate** - Typical traditional farming landscape of the mid and eastern extents of the study area exhibiting some degradation through pressure from development due to its proximity to the A470(T) transport corridor and tourist route to North Wales. **Guideline** **Medium Term** Maintain small scale field pattern - replenishment planting for hedgerows and wooded patches **Immediate** Ensure new development is carefully integrated into existing landscape character - respect field patterns and vegetation cover **Medium Term** Encourage employment of traditional farming practices - hedge laying and coppicing. **Medium sensitivity**	
Classification Level 3: Mosaic Lowland Valleys		
MNTGMVS276 Dyfi Valley Catchment Within ZTV	A very extensive network of valleys containing tributaries leading into the River Dyfi... The area has a dramatic backdrop to the south with the underlying landform falling from the upland moorlands of the Trannon and Plinlimon moors... To the north views are over a picturesque traditionally farmed landscape edged by sporadic rock exposure and marginal grazing land facing onto the meandering Dovey Valley and with a northerly backdrop of steeply rising upland and the edge of SNP...	This LCA lies within 650m of a turbine at its nearest point. Although the ZTV indicates some theoretical visibility from the valley, this will mostly be confined to tips (see VP 7, 8 and 11). Any change to the visual and sensory character of the valley will be low in magnitude and only perceived in localised areas.

Aspect Area Code & Name	Nature of Receptor & Judgement on Sensitivity (Description from LANDMAP VS3; Overall Evaluation and Justification from LANDMAP HL50 & 51; Guidelines from LANDMAP VS32)	Nature of Effect & Judgement on Significance
	Settled safe, and domestic in scale the traditional farmed elements make a stunning foreground for the picturesque hill and mountainscape of the SNP. **Overall Evaluation: High** - Settled safe, and domestic in scale the traditional farmed elements make a stunning foreground for the picturesque hill and mountainscape of the SNP and the River Dovey **Guideline** **Medium Term** Encourage adoption/proliferation of traditional farming techniques - Hedge laying, vernacular style stone walling **Medium Term** Limit intrusive developments out of keeping with small scale scattered developments such as caravan parks **Long Term** Limit intrusive single species forestry plantation on upper slopes - should follow landforms, be diverse in species and of relatively small scale. **High sensitivity**	**Minor** effect in areas from which turbines are visible **Long-term**

APPENDIX 4.3: HISTORY OF VIEWPOINT SELECTION AND PHOTOGRAPHY INFORMATION

History of Viewpoint Selection

18 viewpoints were selected and agreed as part of the original LVIA, in consultation with CCW, Powys County Council and Snowdonia National Park. These are as follows:

1 Glyndŵr's Way, Brynaere

2 Glyndŵr's Way, Cefnllys-uchaf

3 Llangadfan

4 Talerddig High

5 Bryn y Gadair

6 Minor Road near Llanfihangel-yng Ngwynfa

7 Bwlch y Groes, SNP

8 Cadair Idris, SNP

9 Plynlimon

10 Kerry Ridgeway, Two Tumps

11 Aran Fawddwy

12 Llanbrynmair Village

13 Carno Village

14 Llan Village

15 Wynford Vaughan Thomas Memorial

16 Summit of Foel Dugoid

17 Minor road near Aberangell

18 Summit of Foel Dinas

As a result of a meeting CCW and PCC at CCW's Newtown Offices on 11th June 2009 three viewpoints from three new locations (including photomontages) were included in SEI 1:

- Glyndwr's Way at Penyfford 301663, 313001
- Glyndwr's Way at Moel Ddolwen 298302, 307894
- Ffridd Fawr 294700, 303997

SEI 2 included 4 new wireframes (from Caersws and the Caersws Basin) at the request of CCW and PCC (agreed at a meeting on 9th February 2011). These wireframes showed little, if any visibility, from this area. It showed the turbines were visible from Little London but at this distance (17km) they would appear small and the change in view would not be significant.

SEI 3 included an additional wireframe from Dolfach to investigate visibility from this village. In addition, three viewpoints were included in SEI3 to investigate visibility of the track and five viewpoints were included in SEI3 to investigate visibility of the sub-station.

As a result of the removal of turbines during the design of the project there will no longer any visibility of turbines from VP 16 (Summit of Foel Dugoid) and VP 17 (Aberangell) and therefore these viewpoints have been omitted from this LVIA. In addition, only the very tip of one turbine will be visible from VP3 Llangadfan and this would likely be imperceptible – therefore this viewpoint has also been omitted.

Two of the three viewpoints used for the appraisal of visibility of access tracks have been included in this LVIA as assessment viewpoints (track 'VP 6' has been omitted because it is located very close to viewpoint 2, Glyndŵr's Way Cefnllys-uchaf, which has been selected in preference). Track 'VP 8'

(on the road above Fridd Fawr) has been selected over the viewpoint at Fridd Fawr itself since this viewpoint provides a better vantage point.

In addition, two viewpoints have been selected to provide coverage of viewpoints close to the site and to illustrate visibility of tracks and the substation, as well as turbines:

- Minor Road near Cwmderwen
- Glyndŵr's Way Footpath

Finally, in April 2013 Natural Resources Wales (NRW) requested an additional viewpoint from within Nant yr Eira, a new viewpoint to examine the offsite access road works at Gosen bridge from Glyndwr's Way as it crosses Pen Coed, and a revised location for Viewpoint 13 – Glyndwrs Way, Penyfford. Viewpoints were adjusted accordingly.

Photography Information

Table 1: Photogrpahy Information for LVIA Viewpoints

Viewpoint No.	Viewpoint name	Camera Spec	Date	Photographer
1	Glyndŵr's Way above Cwmderwen	Nikon D7000	21st February 2013	LUC
2	Cwmderwen	Nikon D7000	22nd February 2013	LUC
3	Minor road above Ffridd Fawr	Nikon D7000	21st February 2013	LUC
4	Glyndŵr's Way, Cefnllys-uchaf	Nikon D700	25th June 2013	LUC
5	Glyndŵr's Way, minor road east of Neinthirion	Nikon D7000	22nd February 2013	LUC
6	Glyndŵr's Way, Moel Ddolwen	Nikon D700	25th June 2013	LUC
7	Dolfach	Nikon D700	30th May 2013	LUC
8	Llanbrynmair Village	Nikon D700	24th June 2013	LUC
9	Talerddig	Nikon D700	24th June 2013	LUC
10	Glyndŵr's Way, Brynaere	Nikon D700	24th June 2013	LUC
11	Llan Village	Nikon D700	24th June 2013	LUC
12	A470, north of Carno	Nikon D700	24th June 2013	LUC
13	Glyndŵr's Way, Penyfford	Nikon D700	31st May 2013	LUC
14	Bryn y Gadair	Canon EOS 20D	6th May 2008	SKM
15	Wynford Vaughan Thomas Memorial	Nikon D700	26th June 2013	LUC
16	Foel Dinas in Snowdonia National Park	Nikon D700	25th June 2013	LUC
17	Minor road near Llanfihangel-yng Ngwynfa	Nikon D700	25th June 2013	LUC
18	Bwlch y Groes, Snowdonia National Park	Nikon D700	25th June 2013	LUC
19	Aran Fawddwy in Snowdonia National Park	Nikon D700	25th June 2013	LUC
20	Plynlimon	Nikon D700	26th June 2013	LUC
21	Cadair Idris in Snowdonia National Park	Canon EOS 5D	17th April 2008	SKM
22	Kerry Ridgeway, Two Tumps	Unknown	Unknown	SKM
23	Minor Rd within Nant yr Eira	Nikon D700	31st May 2013	LUC
24	Glyndŵr's Way crossing Pen Coed	Nikon D700	31st May 2013	LUC

Table 2: Photogrpahy Information for Cumulative Viewpoints

Viewpoint No.	Viewpoint name	LVIA VP ref.	Camera Spec	Date	Photographer
1	Glyndŵr's Way, Brynaere	10	Nikon D700	24th June 2013	LUC
2	Glyndŵr's Way, Penyfford	13	Nikon D700	31st May 2013	LUC
3	Wynford Vaughan Thomas Memorial	15	Nikon D700	26th June 2013	LUC
4	Foel Dinas in Snowdonia National Park	16	Nikon D700	25th June 2013	LUC
5	Aran Fawddwy in Snowdonia National Park	19	Nikon D700	25th June 2013	LUC
6	Plynlimon	20	Nikon D700	26th June 2013	LUC
7	Cadair Idris in Snowdonia National Park	21	Canon EOS 5D	17th April 2008	SKM
8	Kerry Ridgeway, Two Tumps	22	Unknown	Unknown	SKM
9	Glyndŵr's Way crossing Pen Coed	24	Nikon D700	31st May 2013	LUC
10	Garreg Hir	n/a	Canon EOS 5D (full frame sensor)	09th August 2007	JSA
11	Glyndŵr's Way, east of Pont Llogel	n/a	Canon EOS 5D (full frame sensor)	19th June 2008	JSA
12	Pen yr Allt Uchaf in Snowdonia National Park	n/a	Canon EOS 5D (full frame sensor)	15th April 2008	JSA
13	North-west of Mynydd Waun Fawr, Llyn y Grinwydden Open Access Land	n/a	Canon EOS 5D (full frame sensor)	14th April 2008	JSA
14	Beacon Ring Hillfort	n/a	Nikon D700	26th June 2013	LUC

APPENDIX 4.4: GRID ROUTE ASSESSMENT

1.1 Introduction

1.1.1 Llanbrynmair Wind Farm is proposed on an area of Llanbrynmair Moors, within the Technical Advice Note (TAN) 8: Planning for Renewable Energy Strategic Search Area B (SSA B), Carno North.

1.1.2 The grid connection is not covered by the Section 36 application; its assessment within this SEI is restricted to a high-level Grid Route Assessment as provided in Appendix 4.4. The purpose of the assessment was to identify a number of environmentally and technically feasible broad route corridors which could be taken by grid infrastructure in order to link the proposed wind farm to a National Grid hub. The content and findings of these studies are still current and will remain as such until more detailed information about the Mid Wales Connections Project is made publicly available to RES UK and Ireland Ltd. and other developers by SP Energy Networks (Scottish Power Energy Networks). The release of additional information is scheduled for September 2013 at which time more detailed grid connection routeing study may be required.

1.1.3 Llanbrynmair Wind Farm will require a connection to a 400Kv substation. It is proposed that Llanbrynmair (and other wind farm developments) will be connected to one of two National Grid substation search areas (E - Aberbechan and F - Cefn Coch). The connection for the Llanbrynmair Wind Farm will extend from one proposed onsite substation.

1.1.4 In 2010 a routeing study was undertaken by Land Use Consultants (LUC) to identify a number of environmentally and technically feasible broad route corridors which could be taken by grid infrastructure to link the proposed wind farm to the NG substation should it be located within either of these two Search Areas. This resulted in the identification of nine broad route options:

- NG Substation Search Area E (Aberbechan) – Broad Route Options E1, E2 and E3, and links
- E3a and E2/E3.
- NG Substation Search Area F (Cefn Coch) – Broad Route Options F1, F2, F3 and F4.

1.1.5 In 2011, LUC were commissioned to update the study to include further analysis of the ecological characteristics of the routes. This chapter presents the findings of both the 2010 and the 2011 studies.

1.1.6 The purpose of the routeing study was to identify a number of environmentally and technically feasible broad route corridors which could be taken by grid infrastructure in order to link the proposed wind farm to a National Grid hub. An analysis of each broad route corridor against a set of routeing criteria was also undertaken in order to determine which was likely to be the preferred alternative.

1.1.7 A broad study area (see Figure 5.1) was established to cover a sufficiently large area to enable the identification of broad route corridors.

Assumptions

1.1.8 The study was undertaken on the basis that 132kV overhead power lines would be used, although it will also be applicable to other similar alternatives.

1.1.9 This study was conducted on the assumption that the cable connection type will be overhead lines supported by wooden poles. These could be of various designs and the recommendations of this study would remain the same.

1.1.10 It is recognised that where multiple connections from different wind farms come together, steel towers may be used instead of wooden poles, as a means of avoiding the need to double up on infrastructure. Reference to the suitability of each broad route corridor for both wooden poles and steel towers has been included where this is relevant (i.e. where one of the types would be unsuitable).

1.1.11 As a general rule, where steel towers could be accommodated, then it is also considered that the landscape has capacity to accommodate wooden poles. The reverse however is not always the case.

1.2 Methodology

General Environmental Assessment

1.2.1 The methodology for the 2010 study was devised in accordance with the Landscape Institute and IEMA (2002) Guidelines for Landscape and Visual Impact Assessment, and SNH and the Countryside Agency (2006) Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity. Account was also taken of The Holford Rules[2][3][4] and the extensive experience of Land Use Consultants (LUC) in undertaking outeing studies for grid connection projects elsewhere.

1.2.2 Reference was made where relevant to the Mid Wales Connections Project: Routeing Methodology, latest revision/work in progress (LUC in association with Gillespies, 2010), particularly in terms of informing the technical constraints which apply to routeing.

Baseline

1.2.3 Baseline information was primarily drawn from LANDMAP data for each of the five LANDMAP aspects, which also forms the basis of the Powys LCA[35] , as well as during field surveys of the area undertaken in July 2010.

1.2.4 This informed judgements which were made about landscape and visual sensitivity to overhead lines within the broad study area, as well as in relation to the selection and

Identification of Broad Route Corridors

1.2.5 Broad route corridors to each of the two National Grid substation search areas, E (Aberbechan) and F (Cefn Coch), were identified in accordance with the principles outlined in The Holford Rules. Routeing along valleys and through lower land with wooded and hill backgrounds, and avoiding open sky backgrounds where possible is a desired objective of the rules.

1.2.6 The identification of broad route corridors was informed by desk studies and fieldwork, with corridors often being dictated by topography, steep slopes, sensitive landscape features or the presence of designated landscapes. The criteria used are listed in Section 1.2.11 below.

1.2.7 Routeing close to the peripheries of identified constrained areas may be necessary, therefore some broad route corridors do, in part, encompass the edges of constrained areas.

1.2.8 Three broad route corridors and alternative links to National Grid Substation search area E were identified. These corridors are shown on Figure 5.6.Four broad route

[34] The Holford Rules, updated 1993 (and NGC and SHETL clarification notes, 2003)

[35] Powys Landscape Character Assessment. (LCA), 2008, Powys County Council

corridors and alternative links to National Grid Substation search area F were identified. These corridors are shown on Figure 5.7.

Broad Route Corridor Appraisal Criteria

1.2.9 In order to provide a qualitative, and where appropriate quantitative assessment, identifying the relative strengths and weaknesses of each broad route corridor, a desk and GIS based appraisal was undertaken.

1.2.10 The GIS analysis of the relevant data sets was supplemented by interpretation and the making of judgements by a landscape architect, alongside field observation and analysis.

1.2.11 Broad route corridors were identified and appraised in accordance with The Holford Rules, with reference to the following criteria:

- areas of highest environmental value, as represented by environmental designations, and indicated by evaluations of aspect areas within LANDMAP;
- Historic Landscapes, designated by Cadw;
- technical constraints, including steep slopes, high ground, and infrastructural constraints;
- local level constraints, i.e. local designations, commercial forestry and flood zones;
- landscape sensitivity, informed by LANDMAP, Powys Landscape Assessment and field surveys alongside field work;
- visual amenity, including the nature of existing views and potential visibility, informed by consideration of views from viewpoints identified in LANDMAP, as well as views from footpaths and other recreational receptors;
- residential amenity, informed by consideration of views from towns, villages and scattered properties, and the feasibility of remaining at least 50-100m from properties;
- length of corridor: Holford Rule 3 states that “other things being equal choose the most direct line”.

1.2.12 The appraisal of each Broad Route Corridor against the criteria can be found within this Appendix at section 1.5.

Areas of Highest Environmental Value

1.2.13 Areas of highest environmental value were identified to focus the broad study area, highlighting potential constraints and leading to the identification of broad route corridor search areas. These include the following international, European and national level designations listed below, illustrated on Figure 5.2.

- Special Areas of Conservation (SACs);
- Sites of Special Scientific Interest (SSSIs);
- Scheduled Monuments (SMs);
- Historic Parks and Gardens (HPGs);
- Historic Landscapes (HLs).

1.2.14 The following designations were also mapped, but none were present within the broad study area:

- Ramsar Sites (RSs);
- Special Protection Areas (SPAs);
- National Nature Reserves (NNRs);

- National Parks (NPs);
- World Heritage Sites.

LANDMAP

1.2.15 In addition to the areas of highest environmental value, LANDMAP aspect areas which are classified as 'High' or 'Outstanding' in the overall evaluation were mapped.

1.2.16 Due to the lower relevance of some criteria which form the overall evaluation of geological, cultural and landscape habitat aspects to overhead line routeing, the review concentrated on the Visual & Sensory and Historic aspects, although it did also take account of the other three aspects.

1.2.17 No LANDMAP aspect areas within the broad study area are classified as 'Outstanding' for the Visual & Sensoy Aspect. The LANDMAP areas considered are shown in Figure 5.3a

Technical Constraints

1.2.18 The Holford Rules[36] state that topographic features act as an environmental constraint to the routeing of overhead line grid connection infrastructure due to potential increased visibility when located over high and exposed ground. Topographic features can also act as technical constraints to routeing, specifically higher ground and steep slopes. The Mid-Wales Connections Project: Routeing Methodology5, advises that areas of ground over 400-450m AOD and slopes of over 15-22° may act as technical topographic constraints, and that the routeing of substantial corridor lengths within these areas should be avoided where possible. These topographic constraints are identified on Figure 5.4. Such technical constraints tend not to be absolute as solutions can usually be found, but such areas also coincide with areas of greater landscape sensitivity and so the stated parameters are a useful guide.

1.2.19 The Mid Wales Connections Project: Routeing Methodology also advises against the routeing of overhead line grid infrastructure within around 3 x tip height of proposed or existing wind turbines (unless the lines can be placed underground). All existing and planned turbines within the broad study area are mapped showing the relevant 3x tip height buffer zone. These buffer zones act as a technical constraint and are shown on Figure 5.5.

1.2.20 Existing overhead lines can also act as technical, as well as environmental constraints (through creating visual clutter) to routeing. Existing overhead line grid infrastructure (33kV and 132kV) within the broad study area was mapped and is shown on Figure 5.5.

Local Level Constraints

1.2.21 As well as the national and international level designations listed above, it is important to consider any local level designations within the broad study area. The Powys Unitary Development Plan (UDP) identifies Nature Conservation Sites of Regional and Local Importance, Regionally Important Geological/ Geomorphological Sites (RIGS), Local Nature Reserves and Local Wildlife Sites. Areas with these designations were considered during the broad route corridor appraisals, however none were found to lie within or in close proximity to the broad route corridors identified.

1.2.22 Listed Buildings were also avoided wherever possible, with a 200m buffer applied to all listed buildings within proposed broad route corridors.

1.2.23 Where possible areas of commercial forestry were avoided when defining broad route corridors. Where practically unavoidable for practical reasons, consideration was made within the appraisal f each broad route corridor in order to seek to minimise potential impacts on forested areas.

1.2.24 Areas of Ancient Woodland are not listed under any national or international designation but constitute a constraint to be avoided herever possible in the

[36] The Holford Rules, updated 1993 (and NGC and SHETL clarification notes, 2003

potential routeing of overhead lines. Areas of Ancient Woodland were therefore considered during the appraisal of each broad route corridor.[37]

1.2.25 Flood risk zones within the broad study area were considered at the baseline stage of the assessment and were also assessed during the appraisal of each individual broad route corridor, to avoid routeing overhead lines in areas classified as being at high risk of flooding.

Landscape Sensitivity

1.2.26 The Guidelines for Landscape and Visual Impact Assessment, define landscape sensitivity as follows. Landscape sensitivity is "the extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects on its character. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement."

1.2.27 In devising criteria for judging sensitivity to overhead lines account is taken of SNH and the Countryside Agency (2006) Topic Paper 6:Techniques and Criteria for Judging Capacity and Sensitivity which states *"judging landscape character sensitivity requires professional judgement about the degree to which the landscape in question is robust, in that it is able to accommodate change without adverse impacts on character.This involves making decisions about whether or not significant characteristic elements of the landscape will be liable to loss.... and whether important aesthetic aspects of character will be liable to change".*

1.2.28 Topic Paper 6 distinguishes between inherent landscape sensitivity, which is defined as sensitivity to any change, and landscape sensitivity to a specific type of change. Topic Paper 6 (pages 2-5) states that landscape sensitivity is "related to landscape character and how vulnerable this is to change… Landscapes which are highly sensitive are at risk of having their key characteristics fundamentally altered, leading to a different landscape character… Sensitivity is assessed by onsidering the physical characteristics and the perceptual characteristics of landscapes in light of particular forms of development." The references which are made to sensitivity for this work refer to sensitivity to the specific type of change proposed.

1.2.29 The ability of a landscape to accommodate overhead lines is determined by its existing landscape characteristics and attributes. These characteristics and attributes are categorised by LANDMAP, and also described in the Powys Landscape Character Assessment (LCA) (2008) by John Campion Associates Ltd, which uses LANDMAP as its primary information source, and incorporates the detail provided by the five LANDMAP aspects.

1.2.30 Some impacts associated with overhead lines, including those on the landscape, can be prevented or reduced through careful routeing, with more localised impacts being mitigated through local deviations of a route. In seeking to ensure that impacts are minimised through careful routeing, the sensitivity of the landscape to this form of development is appraised and, where practical, broad route corridors selected which avoid those landscapes deemed to be of highest sensitivity.

1.2.31 Landscape sensitivity was determined using the baseline information provided in LANDMAP and the Powys Landscape Assessment, field work and the application of professional judgement by landscape architects.

1.2.32 To understand how landscape sensitivity varies across the study area and along the broad route corridors, the sensitivity of the landscape to the development of overhead lines is categorised into tiers described as high, medium or low, between which there is a gradual transition, as described in Table 1.1 below.

[37] Mid Wales Connections Project: Routeing Methodology, latest revision/work in progress (LUC in association with Gillespies, 2010)

Table 1.1: Levels and Definitions of Landscape Sensitivity

Sensitivity	Definition
High	A landscape of particularly distinctive character, which may be nationally designated for its scenic quality, or where its character, land use, pattern and scale offer very limited opportunities for the accommodation of change due to overhead lines. Landscape character and attributes are vulnerable to change or loss as a result of overhead lines.
Medium	A landscape of notable character, where its nature, land use, pattern and scale offer some opportunities for the accommodation of change due to overhead lines. The landscape has some robustness of landscape character and attributes and is not especially vulnerable to change as a result of overhead lines.
Low	A landscape which is of low quality or where its character, existing land use, pattern, scale and attributes are tolerant of change due to overhead lines, and are robust, in that change could be accommodated without loss of important attributes or the key characteristics being fundamentally altered as a result of overhead lines.

1.2.33 Attributes of a landscape which could be affected by the introduction of overhead lines into the landscape, and which therefore influence the sensitivity of the landscape include the following, each of which is considered when determining landscape sensitivity for the purposes of this study:

- Landform and scale: steep, elevated landforms are generally more sensitive to overhead lines due to their visual prominence. Broad valleys are generally less sensitive because infrastructure may be backclothed by surrounding high ground. Larger scale landscapes may be able to accommodate bigger structures more easily than smaller scale landscapes;
- Landcover: the existing landcover may indicate which landscapes could best accommodate overhead lines with least change to landscape character. The presence of some woods, trees and hedgerows may reduce the visibility of lines, but continuous woodland increases sensitivity since large wayleaves may have to be cut through the woodlands, which could be intrusive in views.
- Settlement and land use: residential areas and areas used for recreation are generally considered more sensitive to overhead lines given potential impacts on local visual amenity and the resultant effect on the perception of the landscape. Industrial and arable areasare considered less sensitive.
- Landscape features: landscapes with a high density of characteristic or sensitive landscape features, eg trees, native woodland, hedgerows, which may be lost due to overhead line routeing, are generally more sensitive than landscapes with a low density of characteristic landscape features.
- Aesthetic, perceptual and sensory aspects: areas with characteristics of relative remoteness/wildness/tranquility etc may be considered to be more sensitive to overhead lines.
- Skylines, intervisibility and enclosure: open landscapes can be more susceptible to change from overhead lines as they are potentially more visible in these landscapes. Semi- enclosed landscapes are likely to have more restricted intervisibility with other areas, and are therefore considered to be less sensitive. However, in more intimate and enclosed landscapes, overhead lines may affect individual landscape features such as hedgerows and trees. Some areas may be

more sensitive because they are intervisible with other areas, are overlooked, or part of the view as experienced from frequented viewpoints.

- Key views and skylines: some areas of landscape are more visible than others, because of topography and land cover. Some land cover types (trees, hedges and woodland) provide additional local screening.

1.2.34 The Wales Tranquil Areas Map, Land Use Consultants for Countryside Council for Wales 2009, was also reviewed to identify whether broad route corridors were located within areas classified as 'Tranquil' or 'Disturbed' (Zones B & C).

1.2.35 It is noted that 76.59% of Powys is classified as tranquil within the 2009 report and is defined as land undisturbed by noise and visual intrusion. Reducing and where possible avoiding impacts on areas classified as tranquil should therefore be encouraged. Electrical distribution infrastructure is deemed to have a low threshold of disturbance, with an intrusion level of 7 (the lowest classification used within the assessment) for132kV or other overhead lines up to a distance of 0.5km.

Visual Amenity

1.2.36 Supplementary Note A of the Holford Rules states "minimise the visual effect perceived by users of roads and public rights of way, paying particular attention to the effects of recreational, tourist and other well-used routes". An understanding of visual amenity, including the nature of existing views and potential visibility was informed by consideration of views from significant viewpoints identified in LANDMAP, as well as views from footpaths and other recreational receptors.

1.2.37 Viewpoints were selected from significant viewpoints identified in LANDMAP (these viewpoints are included within the LANDMAP dataset, and are titled 'Significant views'). They are usually associated significant landmarks of historical or cultural heritage, gardens and designed landscapes and designated landscapes. The significant views are identified below:

- Plas Dinam - a significant view from a historic garden identified by Cadw;
- Garthmyl Hall - a significant view from a historic garden identified by Cadw;
- Glansevern Hall - a significant view from a historic garden identified by Cadw;
- Gregynog - a significant view from a historic park identified by Cadw;
- Trelydan Hall - a significant view from a historic park identified by Cadw;
- Cefn Bryntalch - a significant view from a historic park identified by Cadw.

Residential Amenity

1.2.38 In order to reduce impact on the general amenity of residents it is desirable to avoid routeing close to residential properties. Urban conurbations within he study area were classified as settlements in accordance with the Powys UDP 6 Strategic Settlement

1.2.39 Hierarchy and were mapped as areas of highest environmental value. Settlements were identified from the 'large urban areas' and 'small urban areas' within the Ordnance Survey data set. Individual Postcode data for the broad study area was plotted (derived from OS MasterMap AddressLayer) and a 100m buffer zone applied to each property. This is shown, along with areas of highest environmental value, on Figure 5.2.

1.2.40 The views from towns, villages and scattered or individual properties were also considered within the appraisal of each broad route corridor.

Length of Corridor

1.2.41 An approximate length of each broad route corridor was calculated, as Holford Rule 3 states that "other things being equal choose the most direct line". This indicates that

a shorter length of corridor is likely to have fewer potential impacts than for a longer route, once other constraints and issues have been avoided.

Identification of Preferred Broad Route Corridors

1.2.42 The identification of preferred broad route corridors followed a detailed appraisal of each of the proposed broad route corridor options against the criteria described above. This appraisal took into account each of the aspects outlined above as part of the desk based study, supplemented by fieldwork.

1.2.43 The appraisals of the proposed broad route corridors to substation search areas E - Aberbechan and F - Cefn Coch shown on Figures 5.6 and 5.7 can be found at section 1.5 of this Appendix 4.4.

Broad Route Corridors to Substation Search Area E – Aberbechan

1.2.44 The appraisal of broad route corridors (section 1.5) indicated that broad route corridors E2 and E3 were preferred for the grid connection between Llanbrynmair and substation search area E.

1.2.45 Broad route corridor E1 was considered less favourable due to its close proximity to the settlements of Llangadfan and Four Crosses, the high number of directional changes required for any proposed routes and the length of the corridor. The broad route corridors are shown on Figure 5.6. Corridors E2 and E3 are described below.

Broad Route Corridor E2

1.2.46 5.2.48 Broad route corridor E2 shares much of broad route corridors F2 and F3 in its western section, and is shown on Figure 5.8. This corridor crosses high ground north of Rhyd Ddu and it is therefore inevitable that lines would be visible on skylines in the western and central sections. The upland western part of the route corridor is classified as undisturbed7 by the Wales Tranquil Areas Map[38]. The western section of the corridor is

1.2.47 located with the TAN 8 Strategic Search Area B and is already due to be subject to landscape and visual changes from consented wind farm proposals within this area. Careful routeing should be possible, backclothing infrastructure against upland slopes and

[6] Powys Unitary Development Plan, Deposit Draft 2004, UDP SP2 – Strategic Settlement Hierarchy

[7] Definition: 'Undisturbed – countryside usually free of any substantial disturbance in daytime'. Electrical distribution infrastructure is deemed to have a low threshold of disturbance, with an intrusion level of 7 (the lowest classification used within the assessment)

[38] Wales Tranquil Areas Map, Land Use Consultants for Countryside Council for Wales, 2009

running close to forest edges, to reduce potential visibility of infrastructure over upland moorland areas.

1.2.48 The central and eastern sections of the corridor are areas with a relatively dense distribution of residential properties and careful routeing will be required to avoid impacts on these properties. Careful routeing within these parts of the corridor could be achieved by positioning lines on lower slopes and routeing alongside woodland edges. Specific provisions to minimise potential visibility will be required close to Tregynon and the corridor of the B3489. The presence of existing overhead lines in the eastern section of the corridor should be considered when exploring route options to minimise the potential for visual clutter.

1.2.49 This broad route corridor could potentially be connected to either the central or northern onsite substations. The availability of alternative substation options will be of benefit when exploring route options as part of further more detailed studies.

Broad Route Corridor E3

1.2.50 Broad route corridor E3 shares much of broad route corridor F4 in its western section, and is shown on Figure 5.9. This broad route corridor crosses high ground south of Rhyd Ddu and it is therefore inevitable that lines would be visible on skylines in the western and central sections, south of Moel Gloria. Much of the corridor is classified as disturbed in its lower eastern reaches by the Wales Tranquil Areas Map. Careful routeing should be possible, backclothing infrastructure against upland slopes and running close to forest edges, to reduce potential visibility of infrastructure over upland moorland areas.

1.2.51 The western section of the corridor is located with the TAN 8 Strategic Search Area B and is already due to be subject to landscape and visual changes from consented wind farm proposals within this area. Careful routeing within the remaining sections of the corridor could be achieved by positioning lines on lower slopes and routeing alongside woodland edges to reduce potential visibility of the lines and avoid impacts on residential properties.

1.2.52 The eastern section of the corridor follows a similar route to the existing Llandinam 132kV overhead line, which runs from Carno Wind Farm to Aberbechan. There is potential for the existing wood pole line and any proposed overhead line to be combined on a steel tower, or alternatively for an additional wooden pole line to run alongside the existing line, depending upon the space available. The addition further of overhead lines could lead to visual clutter, and so should be a consideration when exploring route options as part of further more detailed studies.

1.2.53 This broad route corridor could potentially be connected to either the central or northern onsite substations. The availability of alternative substation options will be of benefit when exploring route options as part of further more detailed studies.

Broad Route Corridor E2/E3 Link

1.2.54 Although both broad route corridor E2 and E3 have been identified as preferred broad route corridor options, there is scope for the two corridors to be combined if necessary. The section which links E2/E3, illustrated on Figure 5.6, encompasses a section of proposed broad route corridor F4 and would enable each of the three Llanbrynmair on site substations (northern, central and southern) to be connected to the NG Substation Search Area E – Aberbechan, via either broad route corridor E2 or E3.

Broad Route Corridors to Substation Search Area F – Cefn Coch

1.2.55 Broad route corridors F3 and F4 were identified as the preferred corridors for the grid connection between Llanbrynmair and substation search area F.

1.2.56 Corridor F1 was considered less favourable due to its close proximity to the settlements of Llangadfan and Four Crosses, the high number of directional changes required for any proposed routes and the length of the corridor.

1.2.57 Corridor F2 was considered less favourable due to the potential routeing limitations through the narrow valley of the Afon Garn River close to Moel-Ddolwen and the high number of directional changes required for any proposed routes. The broad route corridors are shown on Figure 5.7. Corridors F3 and F4 are described below.

Broad Route Corridor F3

1.2.58 This broad route corridor crosses high ground north of Rhyd Ddu and it is therefore inevitable that lines would be visible on skylines in the central and eastern sections of the corridor, as is shown on Figure 5.10.

1.2.59 The entire route corridor is classified as undisturbed by the Wales Tranquil Areas Map.

1.2.60 Careful routeing should be possible, backclothing infrastructure against upland slopes and running close to forest edges, to reduce potential visibility of infrastructure. The large area of coniferous forest around Rhyd Ddu would enable potential routes to be located close to the forest edge, thus reducing potential visibility across the upland moorland areas of the corridor.

1.2.61 The small number of settlements and farmsteads within this corridor means that it should be possible to ensure minimal impact on residential properties. The large scale of the upland landscape through which this corridor passes will to an extent have a greater capacity to accommodate large scale infrastructure than the smaller scale landscapes elsewhere. Infrastructure along this broad route corridor could potentially be connected to either the central or northern on site substations enabling versatility, as described above.

Broad Route Corridor F4

1.2.62 This broad route corridor crosses high ground south of Rhyd Ddu and it is therefore inevitable that routes would be seen on skylines in the western and central sections, south of Moel Gloria. The route corridor is shown on Figure 5.11.

1.2.63 The entire route corridor is classified as undisturbed by the Wales Tranquil Areas Map.

1.2.64 However careful routeing should be possible, backclothing lines against upland slopes and running them close to forest edges. The large coniferous forest areas of Rhyd Ddu and Bryn y Brath offer opportunities backcloth lines against coniferous trees, thus reducing potential visibility over upland moorland areas. The large scale of the upland landscape through which this corridor passes will to an extent have a greater capacity to accommodate large scale infrastructure than the smaller scale landscapes elsewhere. Infrastructure along this broad route corridor could potentially be connected to either the central or northern on site substations enabling versatility, as described above.

Ecological Assessment

1.2.65 The methodology for the ecological assessment involved the review of publically available biological records to describe the ecological characteristics of the Broad Route Options.

1.2.66 The Powys Local Biodiversity Action Plan was reviewed to provide background in terms of the local priorities for habitats and species in the area. No mapping of such features was available or reviewed for these purposes, although at a more detailed stage (once a route has been chosen) it would be appropriate to seek more detailed species data from the local records centre.

1.2.67 In addition the following data sources were reviewed:

- Internationally designated biodiversity sites available from CCW - including Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar Sites.
- Nationally designated sites available from CCW - including Sites of Special Scientific Interest (SSSIs); National Nature Reserves (NNRs); and Local Nature Reserves (LNRs).

- Locally notified sites identified in the Powys Unitary Development Plan (UDP) - includingNature Conservation Sites of Regional and Local Importance and Local Wildlife Sites.
- Other habitat data available from CCW – including Phase 1 Habitat Mapping for Wales and Ancient Woodland.

1.2.68 Although the Phase 1 Habitat Mapping for Wales is relatively old (completed in 1997), it was considered that this would provide a useful indication of the habitats which may be present, particularly when used in combination with OS Base Mapping. Base mapping was also reviewed to provide an indication of topography and the location of watercourses.

1.3 Findings

General Environmental Assessment

1.3.1 The identified broad route corridors described above, demonstrate that electricity could be delivered via a feasible overhead line grid connection from the proposed Llanbrynmair Wind Farm to either of the two National Grid Substation Search Areas, E - Aberbechan and F - Cefn Coch.

1.3.2 Within each of the four proposed broad route corridors there are likely to be several route options which would be feasible for the location of overhead line grid infrastructure.

1.3.3 Further detailed assessment of specific route options and of the relevant constraints which may affect these route options on a more site specific scale is not required as part of this routeing study. It is therefore inappropriate to suggest at this stage that one broad route corridor is a preferred option over another, as this could rule out a feasible broad route corridor option too early in the process.

1.3.4 The merits of each broad route corridor have been outlined in the Identification of Preferred Broad Route Corridors above, and in further detail in the accompanying Broad Route Corridor Appraisal spreadsheet in Appendix SEI1. These broad route corridors demonstrate the different options available for the delivery of power from the proposed Llanbrynmair Wind Farm site to the identified National Grid substation search areas.

1.3.5 As a general rule, where steel towers could be accommodated, then it is also considered that the landscape has capacity to accommodate wooden poles. The reverse however is not always the case.

Ecological Assessment

1.3.6 This section details the priority habitats and species within the Powys LBAP by means of background, with the ecological value specific to the route options then discussed further.

Powys Local Biodiversity Action Plan

1.3.7 The priority habitats and species identified under the Powys LBAP highlight the key landscape types within the local area, including acidic upland areas, lowland agricultural land use and river valleys. The priority habitats are detailed in Table 1.2, with the priority species and their broad habitat preferences listed in Table 1.3.

Table 1.2 LBAP Priority Habitats (Source: Powys LBAP)

Priority Habitat	Brief Description
Upland Oak Woodlands	Upland woods on acidic soils with high rainfall. Tend to be dominated by sessile oak Quercus petraea but pedunculate oak Quercus robur and birch Betula spp. are also common. 10,000 ha in Powys.
Lowland WoodPasture	Typically consists of large, open-grown or high forest trees, in a matrix of grazed grassland, heathland or woodland plants. Fifty- sites known in Powys.
Coniferous Woodland	Woodlands with a high proportion (80% or more) of coniferous species, both native and introduced, are a dominant habitat type in areas of Powys, with 40,700 hectares.
Wet Woodland	Wet woodlands generally occur as small pockets and remnants of habitat in river valleys, at the edges of bogs, mires and fields, and peaty hollows in larger woodlands. Conservative estimates put the amount of alder Alnus glutinosa and willow Salix spp. woodland at 1700 ha for Powys.
Scrub and Ffridd	A very variable habitat, scrub may be defined as progressive or climax vegetation dominated by locally native shrubs, typically less than five metres tall, with a few scattered trees. Ffridd is a characteristic habitat at the periphery of the Welsh uplands between fenced in-bye land and open hill land. Typically a mosaic of bracken Pteridium aquilinum and gorse Ulex spp. often with hawthorn Crataegus monogyna, rowan Sorbus aucuparia and small areas of acid grassland.
Linear Habitats	Hedgerows, roadside verges, railway embankments and other linear features of value to wildlife (with the exception of rivers and streams and canals). Hedgerows are a characteristic feature of the Powys landscape, occurring in both lowland and upland situations.
Rivers and Streams	All running water habitats (rivers and streams) within Powys. Excludes canals, farm ditches, and still waters such as lakes.
Mesotrophic Waters	Powys has a wide range of open waters ranging in nutrient status from the oligotrophic (nutrient poor) pools of the western, peat-covered uplands, to the relatively eutrophic (nutrient rich) waters of lowland sites.
Lowland Raised Bog	Powys has around 250 ha of lowland raised bog, most of it protected by designation.
Rhos Pastures	Wet, acid to neutral grasslands, on nutrient-poor mineral or peat soils; they often occur on low-lying valley bottoms, hillsides and commons. It is estimated that approximately 56,000 ha (24,000 ha of which is lowland) of purple moor-grass and rush pasture is present in the UK. Over half of this, about 35,000 ha, occurs in Wales. Powys supports about 3,600 ha, excluding the Brecon Beacons National Park, around 6% of the UK total.
Lowland Meadows	This action plan describes traditionally managed hay-meadows and pastures. Estimates from the CCW Phase II Lowland Grassland Survey put the area in Powys at 360 ha.
Lowland Dry Acid Grassland	Lowland dry acid grasslands typically occur on base-poor, free-draining soils, overlying acid ocks or superficial deposits such as sands and gravels.

Priority Habitat	Brief Description
Upland Calcareous Grassland	Upland calcareous grasslands occur on base-rich substrates above the upper limit of agricultural enclosure, which is usually 250-300 m. It is not a common vegetation type and usually occurs in mosaics with other upland communities. In Wales, the largest areas of calcareous grassland occur on the limestone of the Powys uplands, mainly in the Brecon Beacons National Park, which holds 60% of the Welsh resource.
Upland Lowland Heath	Upland heath is typically dominated by dwarf shrubs, with over greater than 25%, and lies below the montane zone (at c. 600 - 750m) and above the upper limit of agricultural enclosure (250 - 300m).Lowland heath includes any below an altitude of about 300 m (limit of agricultural enclosure). In Powys, the community usually occurs on the lower slopes of hills where it forms part of an altitudinal zonation of vegetation types from valley bottom, to lowland heath, to upland heath.
Traditional Orchards	A plot of land on which fruit trees are cultivated. A decline in number of orchards across Wales was particularly severe in Powys.
Farmland	This plan aims to raise awareness of biodiversity issues and ways in which all farms can contribute to enhancing the Biodiversity of Powys.
Garden Habitat	Gardens can be small privately owned areas of land, often adjoining other similar areas as well as large formal gardens and Local Authority parks and gardens, and provide a vital link for people to learn about local wildlife.

Table 1.3 LBAP Priority Species (Source: Powys LBAP)

Priority Species	Habitat Requirements
Red squirrel Sciurus vulgaris	Large areas of continuous pure coniferous woodland with a mixture of suitable coniferous species and a range of age-classes.
Brown hare Lepus europaeus	Mixed farming systems provide optimum conditions.
Water vole Arvicola terrestris	Slow moving streams, rivers, canals, ditches and ponds, particularly those with lush bank-side vegetation.
Hazel dormouse Muscardinus avellanarius	The hazel dormouse is heavily reliant on woodlands and ancient hedgerows.
Lesser horseshoe bat Rhinolophus hipposideros	Use a variety of roosts at different times of year. Thought to fly three km or more from the roost and will typically forage in woodlands, hedgerows and tree lined riverbanks.
Pipstrelle bat Pipistrellus spp.	Often roost in buildings and forage in varied habitats but woodland edges, hedgerows and waterways are particularly important.
European otter Lutra lutra	Otters inhabit unpolluted river systems, lakes, marshes, streams, canals and sheltered coasts where there is a variety of fish species, eels and other suitable prey.

Priority Species	Habitat Requirements
Lapwing Vanellus vanellus	The lapwing was once a familiar farmland bird in Powys but now exists as a scarce and declining bird of mixed farmland and rushy pasture in lowland areas of each vice county of Powys.
Curlew Numenius arquata	Curlews depend on open landscapes such as moorland, rough pasture, hay meadows and damp rushy pasture (rhos) during the nesting season. By August most curlews have deserted their breeding sites (to which they are faithful year in year out), to spend the winter in coastal areas.
Tree sparrow Passer montanus	The tree sparrow frequents cultivated land with trees, open woodland and other habitats with scattered trees or mature hedgerows.
Nightjar Caprimulgus europaeus	The most important breeding habitats are lowland heathland and, increasingly, young forestry plantations.
Red kite Milvus milvus	In Wales often associated with deciduous woodland, particularly upland oak woodland, bordering open ffridd; they also nest in lowland woods and parkland areas where they are more productive.
Great crested newt Triturus cristatus	Require still ponds, ditches etc to breed and on land they are associated with rough grassland, scrub and woodland.
Allis shad Alosa alosa and twaite shad Alosa fallax	The status of allis shad within the Wye catchment is urrently unknown, whilst records of twaite shad are reasonably frequent.
Brown trout Salmo trutta	Found most commonly in fast-flowing, unpolluted upland rivers and streams and also in stream-fed lakes.
River lamprey Lampetra fluviatilis	The river lamprey is a migratory species, which grows to maturity in estuaries around Britain and in winter moves into fresh water to spawn in clean rivers and streams. The larvae spend several years in silt beds before metamorphosing and migrating downstream to estuaries and the sea.
White clawed crayfish Austropotamobius pallipes	Typical habitats for white-clawed crayfish in Powys are fast flowing streams with a loose rocky substrate, where they are found beneath the boulders. They also seek shelter in tree roots within the stream or loose alluvial banks. Crevices within retaining stone walls of waterways, e.g. canals, are also favoured habitats. Also known to inhabit standing waters in Powys.
Fairy shrimp Chirocephalus diaphanous	The only known extant population of fairy shrimp in Wales is at a single pool in Radnorshire. Fairy shrimp was also recorded at Penyclawdd, Monmouthshire in the 1970s.
High brown fritillary Argynnis adippe	South facing bracken-covered hillside is the main remaining habitat in Wales for this species.
Pearl bordered fritillary Boloria euphrosyne	In Wales most populations are associated with south-facing bracken slopes or ffridd.
Marsh fritillary Euphydryas aurinia	In Wales the marsh fritillary breeds in damp neutral or acid grasslands (rhôs pastures). In Powys the butterfly occurs mainly on wet grassland habitats and occasionally damp flowery clearings in woodlands.
Red wood ant Formica rufa and northern wood ant Formica lugubris	The Welsh population is concentrated in the conifer plantations of north Wales and also in a few oak woodlands of Merioneth with an outlying population in Radnorshire.

Priority Species	Habitat Requirements
Climbing corydalis weevil Procas granulicollis	Inhabits clearings, rides and light-shaded areas of ungrazed woodland where it is associated with bracken and climbing corydalis Ceratocapnos claviculata.
Globeflower Trollius europaeus	Globeflower is particularly characteristic of tall herb communities on unimproved base-rich soil (calcareous, organic-peaty or clay soils), in mainly water margins, fen, wet grassland, damp hay meadows and woodland edges.
Wood bitter vetch Vicia orobus	Wood bitter-vetch is primarily an upland species, usually found between 200 and 300m and most remaining sites are in Wales and north west Scotland. It is particularly characteristic of well drained old species-rich grassland and hay meadows in fertile, somewhat base- enriched soil.
Floating water plantain Luronium natans	Found in a range of freshwater situations, from upland lakes to lowland canals. The Montgomery Canal supports populations of floating water-plantain throughout its length and for this reason Montgomery Canal has been designated a cSAC.
Pillwort Pilularia globulifera	Pillwort is a small fern found on bare mud in slightly acid to neutral lakes, ponds and shallow pools, particularly at the margins.
Alien plant species	Japanese knotweed (Fallopia japonica) and giant hogweed (Heracleum mantegazzianum).
Waxcap grasslands	Waxcap grassland is a term recently coined to describe nutrient-poor, regularly grazed or mown grassland with a short, well-drained turf that is rich in grassland fungi, particularly waxcap (Hygrocybe) species.
Slender green feather moss Haematocaulis vernicosus	Occurs in usually small patches in slightly basic flushes on upland and lowland sites, with Powys appearing to support a major concentration of sites
River jelly lichen Collema dichotomum	The largest known Welsh population occurs in Powys in the River Irfon between Llangammarch Wells and its confluence with the Wye, and has been subject to outline survey jointly by the EA and CCW. Scattered populations are known to occur between Erwood and Hay on Wye.

Ecological characteristics of the Search Areas

1.3.8 The biodiversity designations and habitats identified within the broad route options for the two search areas are illustrated in Figures 5.12a-c (Search area E), and Figures 5.13a- b (Search area F).

1.3.9 The ecological characteristics of the route options are detailed in Table 1.4 (Search area E) and Table 1.5 (Search area F).

Table 1.4: Ecological characterisation of Broad Route Options Associated with National Grid Substation Search Areas E – Aberbechan

Criterion	Broad Route Option E1	Broad Route Option E2	Broad Route Option E3	Broad Route Option E3a	Broad Route Option E2/E3
International biodiversity designations	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.
National biodiversity designations	Does not contain any SSSI, NNR or LNR.	The route overlaps very slightly with the Gweunydd Dolwen SSSI. A small part of the SSSI is located within the southern part of an east-west section of the route to the east of the Dolwen settlement and south of an existing road. This SSSI is designated for its acid and neutral dry grassland, and dense gorse scrub habitats. Given the small area of overlap with the route it should be possible to avoid impacts to this SSSI. Does not contain any NNR or LNR.	Does not contain any SSSI, NNR or LNR.	Does not contain any SSSI, NNR or LNR.	Does not contain any SSSI, NNR or LNR.
Local biodiversity designations	No local designations were identified within the Powys Unitary Development Plan,	No local designations were identified within the Powys Unitary Development Plan,	No local designations were identified within the Powys Unitary Development	No local designations were identified within the Powys Unitary Developmen	No local designations were identified within the Powys Unitary Development Plan, including

Criterion	Broad Route Option E1	Broad Route Option E2	Broad Route Option E3	Broad Route Option E3a	Broad Route Option E2/E3
	Including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	Including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	t Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.
Habitat description (CCW Phase 1 Habitat Mapping and OS mapping)	The section of Route E1 located between the wind farm site and Hub F is the same as Route F1.This section is therefore described below in Table 1.5. The remainder of this route which runs east from Hub F was predominantly recorded as improved grassland, comprising an agricultural landscape of pasture, hedgerows and treelines with numerous small, connected, linear woodlands and copses. These woodlands were largely recorded as broadleaved	The majority of the section of Route E2 located between the wind farm site and Hub F is the same as Routes F2 and F3. This section is therefore described below in Table 1.5. The northern part of Route E2 also includes an additional area north of F3 and within F2, comprising a loop around a hill at Cefnllys- uchaf. Habitats were similar to those recorded within Route F3 to the south, including improved grassland, marshy grassland and coniferous	The north west section of this route is the same as Route F4 as described in Table 3.4. Route E3 runs to the south east from F4 near Rhyd. The remainder of the route passes through a predominantl y lowland agricultural landscape dominated by improved grassland habitats. These areas also support numerous small, connected, linear woodlands and copses, and would also be likely to support frequent hedgerows. The woodlands were mostly	Route E3a comprises a short section between E2 and E3 to the west of Hub F. This comprises part of Route F with habitats recorded including improved grassland and areas of acid grassland, acid flush and marshy grassland.	The northern section of the E2/E3 Link passes north- south between E2 and E3 west of Hub E, joining E3 near Bwlch-y- ffrid. This section of the link is located in a predominantly agricultural landscape supporting improved grassland. A number of linear semi- natural broadleaved woodland habitats were also recorded, although these appear to be at a lower density than those within areas of E2 and E3. The area would also be likely to support frequent hedgerows. The remainder of this route

Criterion	Broad Route Option E1	Broad Route Option E2	Broad Route Option E3	Broad Route Option E3a	Broad Route Option E2/E3
	but also coniferous, and include both semi- natural and plantation. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire. The route also includes a number of watercourses, including the upper reaches of River Rhiw near Hub F, and the Bechan Brook south of Tregynon.	woodland. It also included areas of broadleaved semi-natural woodland particularly along the Afon Gam and therefore likely to comprise wet woodland. An approximate 4km stretch of the Afon Gam is included within the north west end of this route. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire. The remainder of the route between Hub F and Hub E is the same as Route E1 with lowland agricultural and woodland habitats recorded (see description for E1).	Deciduous and semi- natural, with an area of coniferous plantation spanning the route north east of Carno. Occasional small patches of semi-improved neutral grassland and acid grassland were also recorded along the route, with a large area of acid grassland recorded near Gwern- y-pwyll north of Llanwnog. The route also includes a number of watercourses .		runs east from Bwlch-y-ffrid to Hub E along Route E2 through agricultural habitats with improved grassland and linear woodland habitats (see description for E2).
Notable habitats	No Ancient Woodland sites were identified within the	No Ancient Woodland sites were identified within the	No Ancient Woodland sites were identified within the	No Ancient Woodland sites were identified within the	No Ancient Woodland sites were identified within the

Criterion	Broad Route Option E1	Broad Route Option E2	Broad Route Option E3	Broad Route Option E3a	Broad Route Option E2/E3
	route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	route. Powys BAP Habitats which may be associated with this route include: Scrub and Ffridd Linear Habitats Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland
Species	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in

Criterion	Broad Route Option E1	Broad Route Option E2	Broad Route Option E3	Broad Route Option E3a	Broad Route Option E2/E3
	relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.		relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.

Table 1.5 Ecological characterisation of Broad Route Options Associated with National Grid Substation Search Areas F - Cefn Coch.

Criterion	Broad Route Option F1	Broad Route Option F2	Broad Route Option F3	Broad Route Option F4
International biodiversity designations	Does not contain any internationally designated biodiversity sites.	Does not contain any nternationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.
National biodiversity designations	Does not contain any SSSI, NNR or LNR.	The route overlaps very slightly with the Gweunydd Dolwen SSSI. A small part of the SSSI is located within the southern part of an east-west section of the route to the east of the Dolwen settlement and south of an existing road. This SSSI is designated for its acid and neutral dry grassland, and dense gorse scrub habitats. Given the small area of overlap with the route it should be possible to avoid impacts to this	Does not contain any SSSI, NNR or LNR.	Does not contain any SSSI, NNR or LNR.
Local biodiversity designations	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.

Criterion	Broad Route Option F1	Broad Route Option F2	Broad Route Option F3	Broad Route Option F4
Habitat description (CCW Phase 1 Habitat Mapping and OS mapping)	The majority of the route is located within improved grassland habitats. These habitats are associated with lowland agricultural land uses and include habitats such as hedgerows. Other habitats include small patches of woodland,	The north west section of this route is largely located within areas recorded as improved grassland habitats with small patches of other habitats such as marshy grassland and coniferous plantation. The central part of the	The north west section of this route was mostly recorded as marshy grassland and improved grassland habitats. One large area of coniferous plantation recorded at Trwyn-y-Bryn almost spans the width of the route.	Improved grassland and marshy grassland habitats were recorded within a much of this route. Habitats recorded also included relatively large areas of upland habitats compared to other routes in Search

Criterion	Broad Route Option F1	Broad Route Option F2	Broad Route Option F3	Broad Route Option F4
	including coniferous plantation and broadleaved plantation and semi-natural woodlands. The west part of the route, within and near to the wind farm, includes large areas recorded as marshy grassland within upland areas, localised bracken, and small areas of acid grassland and dry heath habitats within the edge of the route near Pen Coed. The eastern part of the route also passes within the vicinity of upland habitats along the ridge at Disgwylfa although only smallareas of acid grassland, heath and marshy grassland habitats are recorded within the route itself at Pant-y-Milwyr. This route also includes a number of watercourses. The central part of the route crosses and/or follows the Afon Banwy at several locations. The south east section of the route includes a relatively long section of the Afon Einion and its tributaries, which are in turn tributaries of the Afon Banwy. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid	route is dominated by areas of marshy grassland, acid grassland and coniferous plantation. These are likely to be associated with more upland and acidic habitats, with small patches of dry heath located in the vicinity (although not within) this part of the route. The south east part of the route is dominated by improved and marshy grassland habitats. This route includes a number of watercourses. Approximately 1.5km of the north part of the route follows the Afon Gam. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.	The central part of the route is dominated by areas of marshy grassland, acid grassland and coniferous plantation. These are likely to be associated with more upland and acidic habitats, with small patches of dry heath located in the vicinity (although not within) this part of the route. The south east part of the route is dominated by improved and marshy grassland habitats. This route includes a number of watercourses. The Afon Gam spans the width of the route in the north east. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.	Area F. These included acid grassland habitats within the north east of the route in the vicinity of the turbine locations. The central area of the route included a particularly large expanse of acid grassland, with areas of wet heath, acid flush and bracken habitats. This route also encloses, although does not include, areas recorded as coniferous plantation. A single large area of coniferous plantation is included in the southern part of the route near Gors-Dyfwch. This route includes a number of watercourses, including the upper reaches of The Afon Gam. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.

Criterion	Broad Route Option F1	Broad Route Option F2	Broad Route Option F3	Broad Route Option F4
Notable habitats	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland
Species	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to riverine fauna including fish, water vole and otter.

1.4 Conclusions

1.4.1 This routeing study has established that there are feasible means of connecting the Llanbrynmair Wind Farm to the proposed National Grid substation search areas. A number of feasible broad route corridor options have been identified, within which infrastructure could be appropriately accommodated within the surrounding landscape.

1.4.2 National Grid is known to be currently undertaking a detailed consultation exercise into the locations of their proposed substation, which will consider an extensive range of environmental factors. Once National Grid has specified the location of the proposed substation, further studies will be undertaken to determine a more defined grid connection route from Llanbrynmair Wind Farm to the proposed substation would be feasible for the location of overhead line grid infrastructure.

Identification of Potential Route Options

1.4.3 In order to assess the feasibility of potential route options within the identified broad route corridors it would be necessary to carry out detailed appraisal of each possible route option. This appraisal will require additional fieldwork to be carried out to support the desk based assessment of the potential route options.

Ecological Assessment

1.4.4 The above analysis identifies no major constraints associated with any of the Broad Route Options in terms of biodiversity sites designated at the international, national or local level. A single SSSI, Gweunydd Dolwen, has a small area included within Route Options E2 and F2. However, it should be highly possible to site the route in such a way as to avoid impacts on this Site.

1.4.5 Given the above, and assuming sensitive siting of the final overhead route and associated poles, and implementation of appropriate mitigation, it should be possible to accommodate the grid infrastructure within any of the Broad Route Options whilst avoiding significant ecological impacts.

1.4.6 However, certain habitats identified within the routes from CCW Phase 1 Habitat mapping are of particular value, for example given their rarity, sensitivity or associated species. Therefore, wherever possible, impacts on these should be avoided or minimised. Particularly valuable habitats identified include:

1.4.7 Upland habitats. Includes acid grassland and heath (wet and dry) habitats with a small area of basin mire identified at Hub F. Such habitats are of specific value in their own right, but also support a variety of notable species including botanical, invertebrate and ornithological interest.

1.4.8 Woodland habitats. Includes semi-natural and plantation woodlands which may be of value in their own right (particularly broadleaved semi-natural woodland), and can support a range of notable species such as red squirrel, dormouse and a range of bird species. No ancient woodland was identified within the study area which is of particular value given the associated habitats and species these often support.

1.4.9 Lowland agricultural habitats where these support a high density of linear habitat features particularly woodlands and hedgerows. These features provide potential habitat for notable species including as movement and foraging corridors, particularly for bat species (including lesser horseshoe bat) and dormouse. These also provide potential habitat for notable bird species such as tree sparrow.

1.4.10 Rivers and watercourses given the value of these habitats for a range of protected and notable species, including otter, water vole and brown trout (many of the other LBAP priority species associated with this habitat type have a very restricted distribution and would be less likely to be affected by proposals). This habitat is also particularly sensitive to indirect impacts associated with construction, such as siltation, whilst direct impacts can be avoided through sensitive siting of poles.

1.4.11 This is not to say that there are not additional areas of valuable habitats within these routes (such as ffrid, rhos pasture and lowland meadows). However, it is not necessarily possible to identify these through a study of this scale. Identification would require more detailed, site surveys of the selected route, with sensitive siting of infrastructure to avoid or minimise impacts.

1.4.12 In addition to the above sensitive habitats, a general principle is that the shorter the route the lower the potential impact given a reduced area which would be affected by proposals.

1.4.13 On this basis, the favoured Broad Route Options are associated with Hub F given the greatly reduced infrastructure length. Of these options, Route Options F2 and F3 would result in minimal impacts on upland habitats, although there are large areas of conifer plantation along these routes. Route Option F4 would minimise the potential for impacts on woodland habitats although careful siting and/or mitigation would be required to avoid or minimise impacts on heathland habitats. Route F1, although considerably longer, mostly comprises improved grassland habitats with relatively few other habitat features (such as linear woodland). This route would however have greater potential for impacts on watercourses, particularly the Afon Banwy.

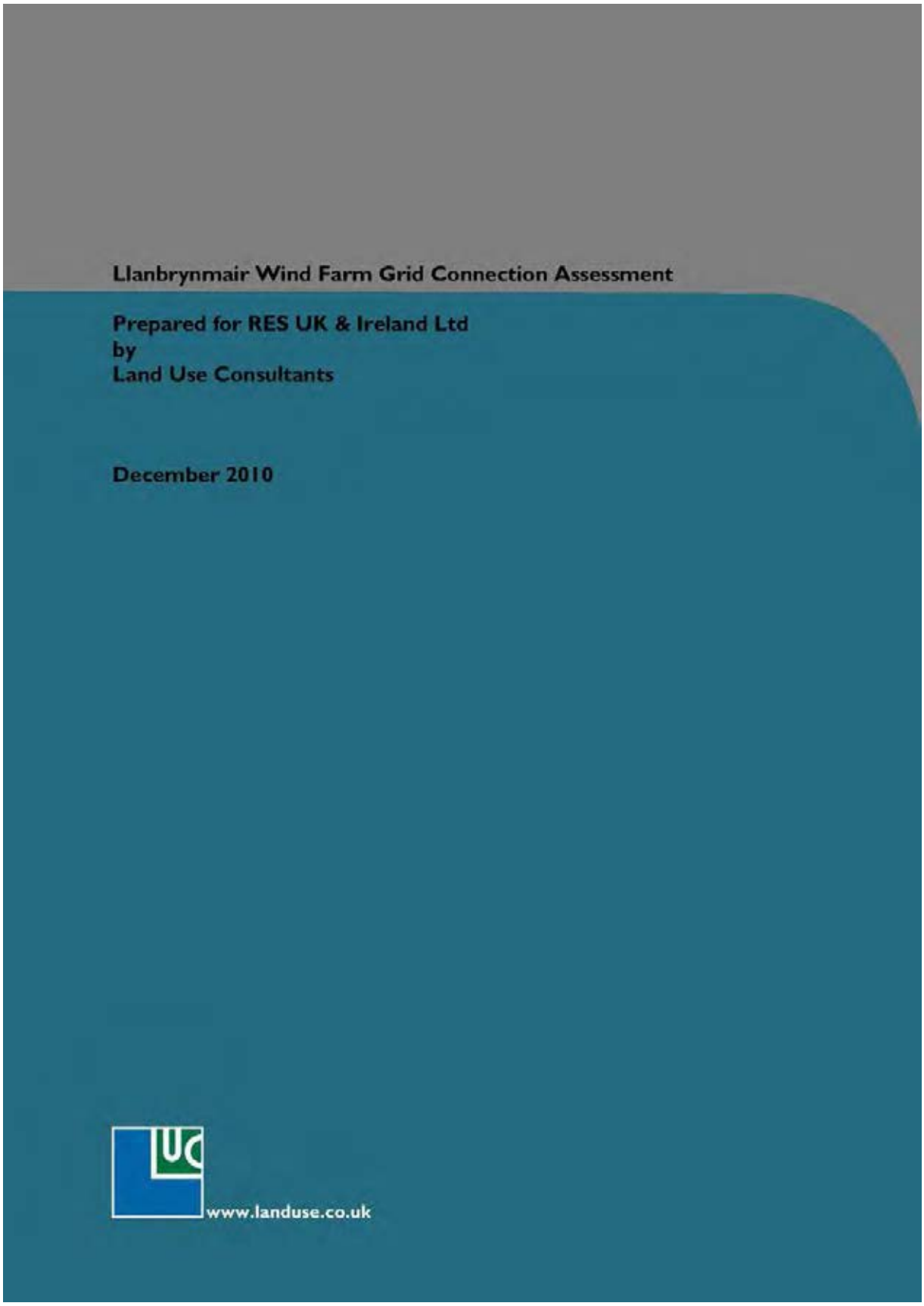
1.4.14 Of the longer infrastructure routes to Hub E, Route Option E3 would appear to have much greater potential to impact on extensive areas of lowland habitat supporting particularly dense networks of linear woodlands and hedgerows. This would potentially result in greater levels of fragmentation for species of bat and other wildlife including dormouse and farmland birds. A grid route through the lowland components of Route Options E1 and 2 would result in similar impacts although potentially to a lesser degree given fewer areas with high densities of linear woodlands and hedgerows.

1.4.15 Of the links, Route Option E2/E3 would result in similar fragmentation impacts to linear woodlands, while E3a would have the potential to impact on upland habitats without appropriate siting and mitigation.

1.4.16 In terms of impacts on species, it is not appropriate to provide a greater level of detail in a study of this scale although the analysis of habitat impacts can provide an indication as discussed.

1.4.17 Once a Broad Route Option has been selected, ground based ecological surveys will be required to identify the habitats currently present, their condition, suitability for protected and notable species, and the presence/absence of such species. As stated previously, with careful siting and the development of mitigation it should be possible to avoid or minimise ecological impacts associated with any of these Broad Route Options.

1.5 Grid Connection Assessment Report


Llanbrynmair Wind Farm Grid Connection Assessment
Prepared for RES UK & Ireland Ltd
by
Land Use Consultants
December 2010
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1 Introduction

1.1 Llanbrynmair Wind Farm is proposed on an area of Llanbrynmair Moors, within the *Technical Advice Note (TAN) 8: Planning for Renewable Energy* Strategic Search Area B (SSA B), Carno North. The Environmental Statement (ES) for the proposed wind farm was submitted to the Department for Energy and Climate Change (DECC) in April 2009 for a scheme comprising 43 proposed wind turbines. The grid connection was not assessed within the ES, as it will be the subject of a separate Section 36 (S36) application.

1.2 Llanbrynmair Wind Farm will require a connection to a 400Kv substation. It is proposed that Llanbrynmair (and other wind farm developments) will be connected to one of two National Grid substation search areas (E - Aberbechan and F - Cefn Coch). The connection for the Llanbrynmair Wind Farm will extend from one of three proposed onsite substations.

1.3 The purpose of this routeing study was therefore to identify a number of environmentally and technically feasible broad route corridors which could be taken by grid infrastructure in order to link the proposed wind farm to a National Grid hub. An analysis of each broad route corridor against a set of routeing criteria was also undertaken in order to determine which was likely to be the preferred alternative.

1.4 A **broad study area** (see **Figure 1**) was established to cover a sufficiently large area to enable the identification of broad route corridors.

1.5 The study was undertaken on the basis that 132kV overhead power lines would be used, although it will also be applicable to other similar alternatives.

Assumptions

1.6 This study was conducted on the assumption that the cable connection type will be overhead lines supported by wooden poles. These could be of various designs and the recommendations of this study would remain the same.

1.7 It is recognised that where multiple connections from different wind farms come together, steel towers may be used instead of wooden poles, as a means of avoiding the need to double up on infrastructure. Reference to the suitability of each broad route corridor for both wooden poles and steel towers has been included where this is relevant (i.e. where one of the types would be unsuitable).

1.8 As a general rule, where steel towers could be accommodated, then it is also considered that the landscape has capacity to accommodate wooden poles. The reverse however is not always the case.

2 Methodology

Introduction

2.1 The methodology for this study was devised in accordance with the Landscape Institute and IEMA (2002) *Guidelines for Landscape and Visual Impact Assessment*, and SNH and the Countryside Agency (2006) *Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity*. Account was also taken of *The Holford Rules*[1] and the extensive experience of Land Use Consultants (LUC) in undertaking routeing studies for grid connection projects elsewhere.

2.2 Reference was made where relevant to the *Mid Wales Connections Project: Routeing Methodology*, latest revision/work in progress (LUC in association with Gillespies, 2010), particularly in terms of informing the technical constraints which apply to routeing.

Baseline

2.3 Baseline information was primarily drawn from LANDMAP data for each of the five LANDMAP aspects, which also forms the basis of the *Powys LCA*[2] , as well as during field surveys of the area undertaken in July 2010.

2.4 This informed judgements which were made about landscape and visual sensitivity to overhead lines within the broad study area, as well as in relation to the selection and assessment of the broad route corridors themselves. Information about determining sensitivity is provided in **Section 2.29**).

Identification of Broad Route Corridor Search Areas

2.5 **Broad route corridor search areas** were identified, being those areas which are not either technically constrained by topographic features or infrastructure, or areas which are not considered to be of highest environmental value, as described in **Section 2.16** These relatively unconstrained areas are therefore considered to be broadly suitable for the routeing of overhead line grid infrastructure, subject to the avoidance of features such as properties, woodland, locally designated sites of features (as far as practical) or other local issues.

2.6 The identified the broad route corridor search area was informed by detailed desk based study of the technical and environmental constraints of the study area. Broad route corridors could then be identified through relatively unconstrained zones of the broad route corridor search area.

Identification of Broad Route Corridors

2.7 **Broad route corridors** to each of the two National Grid substation search areas, E (Aberbechan) and F (Cefn Coch), were identified in accordance with the principles outlined in The Holford Rules. Routeing along valleys and through lower land with wooded and hill backgrounds, and avoiding open sky backgrounds where possible is a desired objective of the rules.

2.8 The identification of broad route corridors was informed by desk studies and fieldwork, with corridors often being dictated by topography, steep slopes, sensitive

[1] *The Holford Rules*, updated 1993 (and NGC and SHETL clarification notes, 2003)
[2] *Powys Landscape Character Assessment. (LCA)*, 2008, Powys County Council

landscape features or the presence of designated landscapes. The criteria used are listed in **Section 2.14** below.

2.9 Routeing close to the peripheries of identified constrained areas may be necessary, therefore some broad route corridors do, in part, encompass the edges of constrained areas.

2.10 Three broad route corridors and alternative links to National Grid Substation search area E were identified. These corridors are shown on **Figure 6**.

2.11 Four broad route corridors and alternative links to National Grid Substation search area F were identified. These corridors are shown on **Figure 7**.

Broad Route Corridor Appraisal Criteria

2.12 In order to provide a qualitative, and where appropriate quantitative assessment, identifying the relative strengths and weaknesses of each broad route corridor, a desk and GIS based appraisal was undertaken.

2.13 The GIS analysis of the relevant data sets was supplemented by interpretation and the making of judgements by a landscape architect, alongside field observation and analysis.

2.14 Broad route corridors were identified and appraised in accordance with *The Holford Rules*, with reference to the following criteria:

- areas of highest environmental value, as represented by environmental designations, and indicated by evaluations of aspect areas within LANDMAP;
- Historic Landscapes, designated by CADW;
- technical constraints, including steep slopes, high ground, and infrastructural constraints;
- local level constraints, i.e. local designations, commercial forestry and flood zones;
- landscape sensitivity, informed by LANDMAP, *Powys Landscape Assessment* and field surveys alongside field work;
- visual amenity, including the nature of existing views and potential visibility, informed by consideration of views from viewpoints identified in LANDMAP, as well as views from footpaths and other recreational receptors;
- residential amenity, informed by consideration of views from towns, villages and scattered properties, and the feasibility of remaining at least 50-100m from properties;
- length of corridor: Holford Rule 3 states that *"other things being equal choose the most direct line"*.

2.15 The appraisal of each Broad Route Corridor against the criteria can be found in **Appendix 1** (*Broad Route Corridor Appraisal*).

Areas of Highest Environmental Value

2.16 Areas of **highest environmental value** were identified to focus the broad study area, highlighting potential constraints and leading to the identification of **broad route corridor search areas**. These include the following international, European and national level designations listed below, illustrated on **Figure 2**.

- Special Areas of Conservation (SACs);
- Sites of Special Scientific Interest (SSSIs);
- Scheduled Monuments (SMs);
- Historic Parks and Gardens (HPGs);
- Historic Landscapes (HLs).

2.17 The following designations were also mapped, but none were present within the broad study area:

- Ramsar Sites (RSs);
- Special Protection Areas (SPAs);
- National Nature Reserves (NNRs);
- National Parks (NPs);
- World Heritage Sites.

LANDMAP

2.18 In addition to the areas of highest environmental value, LANDMAP aspect areas which are classified as 'High' or 'Outstanding' in the overall evaluation were mapped.

2.19 Due to the lower relevance of some criteria which form the overall evaluation of geological, cultural and landscape habitat aspects to overhead line routeing, the review concentrated on the Visual & Sensory and Historic aspects, although it did also take account of the other three aspects.

2.20 No LANDMAP aspect areas within the broad study area are classified as 'Outstanding' for the Visual & Sensory Aspect. The LANDMAP areas considered are shown in **Figure 3a – 3e**.

Technical Constraints

2.21 *The Holford Rules*[3] state that topographic features act as an environmental constraint to the routeing of overhead line grid connection infrastructure due to potential increased visibility when located over high and exposed ground. Topographic features can also act as technical constraints to routeing, specifically higher ground and steep slopes. The *Mid Wales Connections Project: Routeing Methodology*[4], advises that areas of ground over 400-450m AOD and slopes of over 15-22° may act as technical topographic constraints, and that the routeing of substantial corridor lengths within these areas should be avoided where possible. These topographic constraints are identified on **Figure 4**. Such technical constraints tend not to be absolute as solutions can usually be found, but such areas also coincide with areas of greater landscape sensitivity and so the stated parameters are a useful guide.

2.22 The *Mid Wales Connections Project: Routeing Methodology* also advises against the routeing of overhead line grid infrastructure within around 3 x tip height of proposed or existing wind turbines (unless the lines can be placed underground). All existing and planned turbines within the broad study area are mapped showing the

[3] *The Holford Rules*, updated 1993 (and NGC and SHETL clarification notes, 2003)
[4] *Mid Wales Connections Project: Routeing Methodology*, latest revision/work in progress (LUC in association with Gillespies, 2010)

relevant 3 x tip height buffer zone. These buffer zones act as a technical constraint and are shown on **Figure 5**.

2.23 Existing overhead lines can also act as technical, as well as environmental constraints (through creating visual clutter) to routeing. Existing overhead line grid infrastructure (33kV and 132kV) within the broad study area was mapped and is shown on **Figure 5**.

Local Level Constraints

2.24 As well as the national and international level designations listed in **Section 2.9**, it is important to consider any local level designations within the broad study area. The Powys Unitary Development Plan (UDP) identifies Nature Conservation Sites of Regional and Local Importance, Regionally Important Geological/ Geomorphological Sites (RIGS), Local Nature Reserves and Local Wildlife Sites. Areas with these designations were considered during the broad route corridor appraisals, however none were found to lie within or in close proximity to the broad route corridors identified.

2.25 Listed Buildings were also avoided wherever possible, with a 200m buffer applied to all listed buildings within proposed broad route corridors.

2.26 Where possible areas of commercial forestry were avoided when defining broad route corridors. Where practically unavoidable for practical reasons, consideration was made within the appraisal of each broad route corridor in order to seek to minimise potential impacts on forested areas.

2.27 Areas of Ancient Woodland are not listed under any national or international designation but constitute a constraint to be avoided wherever possible in the potential routeing of overhead lines. Areas of Ancient Woodland were therefore considered during the appraisal of each broad route corridor.

2.28 Flood risk zones within the broad study area were considered at the baseline stage of the assessment and were also assessed during the appraisal of each individual broad route corridor, to avoid routeing overhead lines in areas classified as being at high risk of flooding.

Landscape Sensitivity

2.29 The *Guidelines for Landscape and Visual Impact Assessment* (Glossary, page 119), define landscape sensitivity as follows. Landscape sensitivity *is "the extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects on its character. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement."*

2.30 In devising criteria for judging sensitivity to overhead lines account is taken of SNH and the Countryside Agency (2006) *Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity* which states *"judging landscape character sensitivity requires professional judgement about the degree to which the landscape in question is robust, in that it is able to accommodate change without adverse impacts on character. This involves making decisions about whether or not significant characteristic elements of the landscape will be liable to loss.... and whether important aesthetic aspects of character will be liable to change"*.

2.31 *Topic Paper 6* distinguishes between inherent landscape sensitivity, which is defined as sensitivity to any change, and landscape sensitivity to a specific type of change. *Topic Paper 6* (pages 2-5) states that landscape sensitivity is *"related to landscape character and how vulnerable this is to change… Landscapes which are highly sensitive are at risk of having their key characteristics fundamentally altered, leading to a different landscape*

character... Sensitivity is assessed by considering the physical characteristics and the perceptual characteristics of landscapes in light of particular forms of development." The references which are made to sensitivity for this work refer to sensitivity to the specific type of change proposed.

2.32 The ability of a landscape to accommodate overhead lines is determined by its existing landscape characteristics and attributes. These characteristics and attributes are categorised by LANDMAP, and also described in the *Powys Landscape Character Assessment* (LCA) (2008) by John Campion Associates Ltd, which uses LANDMAP as its primary information source, and incorporates the detail provided by the five LANDMAP aspects.

2.33 Some impacts associated with overhead lines, including those on the landscape, can be prevented or reduced through careful routeing, with more localised impacts being mitigated through local deviations of a route. In seeking to ensure that impacts are minimised through careful routeing, the sensitivity of the landscape to this form of development is appraised and, where practical, broad route corridors selected which avoid those landscapes deemed to be of highest sensitivity.

2.34 Landscape sensitivity was determined using the baseline information provided in LANDMAP and the *Powys Landscape Assessment*, field work and the application of professional judgement by landscape architects.

2.35 To understand how landscape sensitivity varies across the study area and along the broad route corridors, the sensitivity of the landscape to the development of overhead lines is categorised into tiers described as high, medium or low, between which there is a gradual transition, as described in **Table 1** below.

Table 1: Levels and Definitions of Landscape Sensitivity

Sensitivity	Definition
High	A landscape of particularly distinctive character, which may be nationally designated for its scenic quality, or where its character, land use, pattern and scale offer very limited opportunities for the accommodation of change due to overhead lines. Landscape character and attributes are vulnerable to change or loss as a result of overhead lines.
Medium	A landscape of notable character, where its nature, land use, pattern and scale offer some opportunities for the accommodation of change due to overhead lines. The landscape has some robustness of landscape character and attributes and is not especially vulnerable to change as a result of overhead lines.
Low	A landscape which is of low quality or where its character, existing land use, pattern, scale and attributes are tolerant of change due to overhead lines, and are robust, in that change could be accommodated without loss of important attributes or the key characteristics being fundamentally altered as a result of overhead lines.

2.36 Attributes of a landscape which could be affected by the introduction of overhead lines into the landscape, and which therefore influence the sensitivity of the landscape include the following, each of which is considered when determining landscape sensitivity for the purposes of this study:

- Landform and scale: steep, elevated landforms are generally more sensitive to overhead lines due to their visual prominence. Broad valleys are generally less sensitive because infrastructure may be backclothed by surrounding high ground. Larger scale landscapes may be able to accommodate bigger structures more easily than smaller scale landscapes;
- Landcover: the existing landcover may indicate which landscapes could best accommodate overhead lines with least change to landscape character. The

presence of some woods, trees and hedgerows may reduce the visibility of lines, but continuous woodland increases sensitivity since large wayleaves may have to be cut through the woodlands, which could be intrusive in views.

- Settlement and land use: residential areas and areas used for recreation are generally considered more sensitive to overhead lines given potential impacts on local visual amenity and the resultant effect on the perception of the landscape. Industrial and arable areas are considered less sensitive.
- Landscape features: landscapes with a high density of characteristic or sensitive landscape features, eg trees, native woodland, hedgerows, which may be lost due to overhead line routeing, are generally more sensitive than landscapes with a low density of characteristic landscape features.
- Aesthetic, perceptual and sensory aspects: areas with characteristics of relative remoteness/wildness/tranquillity etc may be considered to be more sensitive to overhead lines.
- Skylines, intervisibility and enclosure: open landscapes can be more susceptible to change from overhead lines as they are potentially more visible in these landscapes. Semi-enclosed landscapes are likely to have more restricted intervisibility with other areas, and are therefore considered to be less sensitive. However, in more intimate and enclosed landscapes, overhead lines may affect individual landscape features such as hedgerows and trees. Some areas may be more sensitive because they are intervisible with other areas, are overlooked, or part of the view as experienced from frequented viewpoints.
- Key views and skylines: some areas of landscape are more visible than others, because of topography and land cover. Some land cover types (trees, hedges and woodland) provide additional local screening.

2.37 The *Wales Tranquil Areas Map*, Land Use Consultants for Countryside Council for Wales 2009, was also reviewed to identify whether broad route corridors were located within areas classified as 'Tranquil' or 'Disturbed' (Zones B & C).

2.38 It is noted that 76.59% of Powys is classified as tranquil within the 2009 report and is defined as land undisturbed by noise and visual intrusion. Reducing and where possible avoiding impacts on areas classified as tranquil should therefore be encouraged. Electrical distribution infrastructure is deemed to have a low threshold of disturbance, with an intrusion level of 7 (the lowest classification used within the assessment) for 132kV or other overhead lines up to a distance of 0.5km.

Visual Amenity

2.39 Supplementary Note A of the Holford Rules states *"minimise the visual effect perceived by users of roads and public rights of way, paying particular attention to the effects of recreational, tourist and other well-used routes"*. An understanding of visual amenity, including the nature of existing views and potential visibility was informed by consideration of views from significant viewpoints identified in LANDMAP, as well as views from footpaths and other recreational receptors.

2.40 Viewpoints were selected from significant viewpoints identified in LANDMAP (these viewpoints are included within the LANDMAP dataset, and are titled '*Significant views*'). They are usually associated significant landmarks of historical or cultural heritage, gardens and designed landscapes and designated landscapes. The significant views are identified below:

- **Plas Dinam -** a significant view from a historic garden identified by CADW;
- **Garthmyl Hall** - a significant view from a historic garden identified by CADW;

- **Glansevern Hall** - a significant view from a historic garden identified by CADW;
- **Gregynog** - a significant view from a historic park identified by CADW;
- **Trelydan Hall** - a significant view from a historic park identified by CADW;
- **Cefn Bryntalch** - a significant view from a historic park identified by CADW.

Residential Amenity

2.41 In order to reduce impact on the general amenity of residents it is desirable to avoid routeing close to residential properties. Urban conurbations within the study area were classified as settlements in accordance with the *Powys UDP[5] Strategic Settlement Hierarchy* and were mapped as areas of highest environmental value. Settlements were identified from the 'large urban areas' and 'small urban areas' within the Ordnance Survey data set. Individual Postcode data for the broad study area was plotted (derived from OS MasterMap AddressLayer) and a 100m buffer zone applied to each property. This is shown, along with areas of highest environmental value, on **Figure 2**.

2.42 The views from towns, villages and scattered or individual properties were also considered within the appraisal of each broad route corridor.

Length of Corridor

2.43 An approximate length of each broad route corridor was calculated, as *Holford Rule 3* states that *"other things being equal choose the most direct line"*. This indicates that a shorter length of corridor is likely to have fewer potential impacts than for a longer route, once other constraints and issues have been avoided.

Identification of Preferred Broad Route Corridors

2.44 The identification of **preferred broad route corridors** followed a detailed appraisal of each of the proposed broad route corridor options against the criteria described above. This appraisal took into account each of the aspects outlined above as part of the desk based study, supplemented by fieldwork.

2.45 The appraisals of the proposed broad route corridors to substation search areas E - Aberbechan and F - Cefn Coch shown on **Figures 6** and **7** can be found in **Appendix 1.**

Broad Route Corridors to Substation Search Area E – Aberbechan

2.46 The appraisal of broad route corridors **(Appendix 1)** indicated that broad route corridors E2 and E3 were preferred for the grid connection between Llanbrynmair and substation search area E.

2.47 Broad route corridor E1 was considered less favourable due to its close proximity to the settlements of Llangadfan and Four Crosses, the high number of directional changes required for any proposed routes and the length of the corridor. The broad route corridors are shown on **Figure 6**. Corridors E2 and E3 are described below.

Broad Route Corridor E2

2.48 Broad route corridor E2 shares much of broad route corridors F2 and F3 in its western section, and is shown on **Figure 8**. This corridor crosses high ground north of Rhyd Ddu and it is therefore inevitable that lines would be visible on skylines in the western and central sections. The upland western part of the route corridor is

[5] *Powys Unitary Development Plan, Deposit Draft 2004, UDP SP2 – Strategic Settlement Hierarchy*

classified as undisturbed[6] by the *Wales Tranquil Areas Map*[7]. The western section of the corridor is located with the TAN 8 Strategic Search Area B and is already due to be subject to landscape and visual changes from consented wind farm proposals within this area. Careful routeing should be possible, backclothing infrastructure against upland slopes and running close to forest edges, to reduce potential visibility of infrastructure over upland moorland areas.

2.49 The central and eastern sections of the corridor are areas with a relatively dense distribution of residential properties and careful routeing will be required to avoid impacts on these properties. Careful routeing within these parts of the corridor could be achieved by positioning lines on lower slopes and routeing alongside woodland edges. Specific provisions to minimise potential visibility will be required close to Tregynon and the corridor of the B3489. The presence of existing overhead lines in the eastern section of the corridor should be considered when exploring route options to minimise the potential for visual clutter.

2.50 This broad route corridor could potentially be connected to either the central or northern onsite substations. The availability of alternative substation options will be of benefit when exploring route options as part of further more detailed studies.

Broad Route Corridor E3

2.51 Broad route corridor E3 shares much of broad route corridor F4 in its western section, and is shown on **Figure 9**. This broad route corridor crosses high ground south of Rhyd Ddu and it is therefore inevitable that lines would be visible on skylines in the western and central sections, south of Moel Gloria. Much of the corridor is classified as disturbed in its lower eastern reaches by the *Wales Tranquil Areas Map*. Careful routeing should be possible, backclothing infrastructure against upland slopes and running close to forest edges, to reduce potential visibility of infrastructure over upland moorland areas.

2.52 The western section of the corridor is located with the TAN 8 Strategic Search Area B and is already due to be subject to landscape and visual changes from consented wind farm proposals within this area. Careful routeing within the remaining sections of the corridor could be achieved by positioning lines on lower slopes and routeing alongside woodland edges to reduce potential visibility of the lines and avoid impacts on residential properties.

2.53 The eastern section of the corridor follows a similar route to the existing Llandinam 132kV overhead line, which runs from Carno Wind Farm to Aberbechan. There is potential for the existing wood pole line and any proposed overhead line to be combined on a steel tower, or alternatively for an additional wooden pole line to run alongside the existing line, depending upon the space available. The addition further of overhead lines could lead to visual clutter, and so should be a consideration when exploring route options as part of further more detailed studies.

2.54 This broad route corridor could potentially be connected to either the central or northern onsite substations. The availability of alternative substation options will be of benefit when exploring route options as part of further more detailed studies.

Broad Route Corridor E2/E3 Link

2.55 Although both broad route corridor E2 and E3 have been identified as preferred broad route corridor options, there is scope for the two corridors to be combined

[6] Definition: *'Undisturbed – countryside usually free of any substantial disturbance in daytime'. Electrical distribution infrastructure is deemed to have a low threshold of disturbance, with an intrusion level of 7 (the lowest classification used within the assessment)*
[7] *Wales Tranquil Areas Map*, Land Use Consultants for Countryside Council for Wales, 2009.

if necessary. The section which links E2/E3, illustrated on **Figure 6**, encompasses a section of proposed broad route corridor F4 and would enable each of the three Llanbrynmair on site substations (northern, central and southern) to be connected to the NG Substation Search Area E – Aberbechan, via either broad route corridor E2 or E3.

Broad Route Corridors to Substation Search Area F – Cefn Coch

2.56 Broad route corridors F3 and F4 were identified as the preferred corridors for the grid connection between Llanbrynmair and substation search area F.

2.57 Corridor F1 was considered less favourable due to its close proximity to the settlements of Llangadfan and Four Crosses, the high number of directional changes required for any proposed routes and the length of the corridor.

2.58 Corridor F2 was considered less favourable due to the potential routeing limitations through the narrow valley of the Afon Garn River close to Moel-Ddolwen and the high number of directional changes required for any proposed routes. The broad route corridors are shown on **Figure 7**. Corridors F3 and F4 are described below.

Broad Route Corridor F3

2.59 This broad route corridor crosses high ground north of Rhyd Ddu and it is therefore inevitable that lines would be visible on skylines in the central and eastern sections of the corridor, as is shown on **Figure 10**.

2.60 The entire route corridor is classified as undisturbed by the *Wales Tranquil Areas Map*. Careful routeing should be possible, backclothing infrastructure against upland slopes and running close to forest edges, to reduce potential visibility of infrastructure. The large area of coniferous forest around Rhyd Ddu would enable potential routes to be located close to the forest edge, thus reducing potential visibility across the upland moorland areas of the corridor.

2.61 The small number of settlements and farmsteads within this corridor means that it should be possible to ensure minimal impact on residential properties. The large scale of the upland landscape through which this corridor passes will to an extent have a greater capacity to accommodate large scale infrastructure than the smaller scale landscapes elsewhere. Infrastructure along this broad route corridor could potentially be connected to either the central or northern on site substations enabling versatility, as described above.

Broad Route Corridor F4

2.62 This broad route corridor crosses high ground south of Rhyd Ddu and it is therefore inevitable that routes would be seen on skylines in the western and central sections, south of Moel Gloria. The route corridor is shown on **Figure 11**.

2.63 The entire route corridor is classified as undisturbed by the *Wales Tranquil Areas Map*. However careful routeing should be possible, backclothing lines against upland slopes and running them close to forest edges. The large coniferous forest areas of Rhyd Ddu and Bryn y Brath offer opportunities backcloth lines against coniferous trees, thus reducing potential visibility over upland moorland areas. The large scale of the upland landscape through which this corridor passes will to an extent have a greater capacity to accommodate large scale infrastructure than the smaller scale landscapes elsewhere. Infrastructure along this broad route corridor could potentially be connected to either the central or northern on site substations enabling versatility, as described above.

3 Findings

3.1 The identified broad route corridors described above, demonstrate that electricity could be delivered via a feasible overhead line grid connection from the proposed Llanbrynmair Wind Farm to either of the two National Grid Substation Search Areas, E - Aberbechan and F - Cefn Coch.

3.2 Within each of the four proposed broad route corridors there are likely to be several route options which would be feasible for the location of overhead line grid infrastructure.

3.3 Further detailed assessment of specific route options and of the relevant constraints which may affect these route options on a more site specific scale is not required as part of this routeing study. It is therefore inappropriate to suggest at this stage that one broad route corridor is a preferred option over another, as this could rule out a feasible broad route corridor option too early in the process.

3.4 The merits of each broad route corridor have been outlined in the **Identification of Preferred Broad Route Corridors** above, and in further detail in the accompanying Broad Route Corridor Appraisal spreadsheet in **Appendix 1**. These broad route corridors demonstrate the different options available for the delivery of power from the proposed Llanbrynmair Wind Farm site to the identified National Grid substation search areas.

4 Further Assessment

4.1 This routeing study has established that there are feasible means of connecting the Llanbrynmair Wind Farm to the proposed National Grid substation search areas. A number of feasible board route corridor options have been identified, within which infrastructure could be appropriately accommodated within the surrounding landscape.

4.2 National Grid is known to be currently undertaking a detailed consultation exercise into the locations of their proposed substation, which will consider an extensive range of environmental factors. Once National Grid has specified the location of the proposed substation, further studies will be undertaken to determine a more defined grid connection route from Llanbrynmair Wind Farm to the proposed substation.

Identification of Potential Route Options

4.3 In order to assess the feasibility of **potential route options** within the identified broad route corridors it would be necessary to carry out detailed appraisal of each possible route option. This appraisal will require additional fieldwork to be carried out to support the desk based assessment of the potential route options.

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	Broad Route Corridor	E1	E2	E3	E1a	E2a	T1	T2	T3	T4
	On site substation	Northern	Northern / Central	Central / Southern	Northern	Northern / Central	Northern	Northern	Northern / Central	Central / Southern
Areas of Highest Environmental Value	Ramsar	No	No	No	No	No	No	No	No	No
	SPA	No	No	No	No	No	No	No	No	No
	SAC	No	No	No	No	No	No	No	No	No
	SAC Name	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	SAC Area (ha)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	International Nature Conservation Designations Comments	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations	Does not contain any international level nature conservation designations
	SSSI	No	Yes	No	No	No	No	Yes	No	No
	SSSI Name	n/a	Gweunydd Dolwen	n/a	n/a	n/a	n/a	Gweunydd Dolwen	n/a	n/a
	SSSI Area (ha)	n/a	2.33	n/a	n/a	n/a	n/a	2.33	n/a	n/a
	SSSI Comments	n/a	Careful routeing within corridor can avoid impact on SSSI	n/a	n/a	n/a	n/a	Careful routeing within corridor can avoid impact on SSSI	n/a	n/a
	NNR	No	No	No	No	No	No	No	No	No
	National Park	No	No	No	No	No	No	No	No	No
	AONB	No	No	No	No	No	No	No	No	No
	SM	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
	SM No.	4	2	1	4	2	3	n/a	n/a	n/a
	Key SMs	Llysun Motte & Bailey, Mynydd Waun Fawr Roman Road, Gelli Gethin Round Cairn, Tregynon Moated Site	Mynydd y Gribin Kerb Cairn,Tregynon Moated Site	Careg Llwyd	Llysun Motte & Bailey, Mynydd Waun Fawr Roman Road, Gelli Gethin Round Cairn, Careg Llwyd	Mynydd y Gribin Kerb Cairn, Careg Llwyd	Llysun Motte & Bailey, Mynydd Waun Fawr Roman Road, Gelli Gethin Round Cairn	n/a	n/a	n/a
	SM Area (ha)	0.936	0.640	0.005	0.596	0.050	0.591	n/a	n/a	n/a
	SM Comments	Careful routeing within corridor can avoid impact on SAMs	Careful routeing within corridor can avoid impact on SAMs	Careful routeing within corridor can avoid impact on SAMs	Careful routeing within corridor can avoid impact on SAMs	Careful routeing within corridor can avoid impact on SAMs	Careful routeing within corridor can avoid impact on SAMs	n/a	n/a	n/a
	Historic Park or Garden	No	No	No	No	No	No	No	No	No
	HPG Name	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	HPG Area (ha)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Essential Setting	No	No	No	Yes	Yes	No	No	No	No
	Essential Setting Name	n/a	n/a	n/a	Gregynog HPG	Gregynog HPG	n/a	n/a	n/a	n/a
	CA	Yes	Yes	No	No	No	No	No	No	No
	CA Count	1	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	CA Comment	Tregynon	Tregynon	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	LB	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
	LB No.	27	13	5	23	9	15	0	1	0
	Urban Areas	Yes	Yes	No	Yes	Yes	Yes	No	No	No
	No. of urban areas	3	3	n/a	2	2	1	n/a	n/a	n/a
	Urban Areas area (ha)	56.44	45.06	n/a	35.11	23.73	15.76	n/a	n/a	n/a
Historic Landscapes	Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes	Does not go through any Historic Landscapes
	HL Name	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	HL Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Historic Landscapes Comments	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Technical Topographic Constraints	Highest Elevation (metres AOD)	371m AOD	411m AOD	410m AOD	371m AOD	411m AOD	371m AOD	403m AOD	403m AOD	410m AOD
	Typical Elevation (metres AOD)	The majority of the corridor is below 300m AOD, with two smaller sections between 300-400m at the start and the middle of the corridor	Much of the NW half of the corridor is below 350m AOD. The central part of the corridor has one ridge of 300-411m AOD. The E section of the corridor is typically below 300m	Much of the NW half of the corridor is between 300-360m AOD. The SE half of the corridor is typically less than 300m AOD, with one ridge of 300-410m AOD	The majority of the corridor is below 300m AOD, with two smaller sections between 300-400m at the start and the middle of the corridor	Much of the NW half of the corridor is below 350m AOD. The central part of the corridor has one ridge of 300-411m AOD. The SE section of the corridor is typically below 300m	The majority of the corridor is below 300m AOD, with two smaller sections between 300-400m at the start and the end of the corridor	The majority of the corridor is between 300-350m AOD, with areas between 350-403m at the start and the end of the corridor	The majority of the corridor is between 300-350m AOD, with areas between 350-403m at the start and the end of the corridor	Much of the NW half of the corridor is on land between 300-400m AOD. There is one area of the corridor close to Rhyd Ddu of 400m AOD >
	Maximum Slope Gradient (°)	23°	23°	25°	25°	23°	23°	23°	18°	25°

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	Typical Slope Gradient [°]	The vast majority of the corridor is less than 15°. There is a steep bank of >22° at Caer-y-mynydd, a steep ridge of 22°> close to Bryn Farm and a bank of >16° at Capel Horeb	The vast majority of the corridor is less than 15°. There is a steep N facing slope of 22° at Hafod and a steep ridge of >22° close to Bryn Farm	The vast majority of the corridor is less than 15°. There is a steep slope of >18° to the SE of the central substation, a slope of >15° N of Ffridd Isaf and a 16-19° bank NE of Dolfeo	The vast majority of the corridor is less than 15°. There is a steep bank of >22° at Caer-y-mynydd, a bank of >16° at Capel Horeb and a steep bank of 15-23° S of Cefn-llydan	The vast majority of the corridor is less than 15°. There is a steep N facing slope of >22° at Hafod and a steep bank of 15-23° S of Cefn-llydan	The vast majority of the corridor is less than 15°. There is a steep bank of >22° at Caer-y-mynydd and a bank of >16° at Capel Horeb	The vast majority of the corridor is less than 15°. There is a steep N facing slope of >22° at Hafod	The vast majority of the corridor is less than 15°	The vast majority of the corridor is less than 15°. There is a steep slope of >18° to the SE of the central substation and a bank of >17° just SE of Twmpath Melyn
Technical Infrastructural Constraints	Existing Windfarm Developments	No	No	No	No	No	No	No	No	No
	Development Name	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Comments	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Proposed Windfarm Developments	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Development Name	Llanbrynmair	Llanbrynmair, Tirgi Gwynt, Rhyd Ddu	Llanbrynmair, Tirgi Gwynt, Rhyd Ddu	Llanbrynmair	Llanbrynmair, Tirgi Gwynt, Rhyd Ddu	Llanbrynmair	Llanbrynmair, Tirgi Gwynt, Rhyd Ddu	Llanbrynmair, Tirgi Gwynt, Rhyd Ddu	Llanbrynmair, Tirgi Gwynt, Rhyd Ddu
	Comments	Substation location within 3x Tip height buffer of Turbines	Substation location and Corridor within 3x Tip height buffer of Turbines	Substation location and Corridor within 3x Tip height buffer of Turbines.	Substation location within 3x Tip height buffer of Turbines	Substation location and Corridor within 3x Tip height buffer of Turbines	Substation location within 3x Tip height buffer of Turbines	Substation location and Corridor within 3x Tip height buffer of Turbines	Substation location and Corridor within 3x Tip height buffer of Turbines	Substation location and Corridor within 3x Tip height buffer of Turbines
	Existing OHL	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
	Comments	Existing 33kV OHLs run across corridor close to Llangadfan and the A458 and south along the corridor from Tregynon	Existing 33kV OHL runs south along south from Tregynon	Existing 33kV line runs through the end of the corridor close to Highgate. Existing 132kV OHL runs along corridor from close to Carno to Aberbechan	Existing 33kV OHLs runs across corridor close to Llangadfan and the A458 and south from Tregynon	Existing 33kV line runs through the end of the corridor close to Highgate. Existing 132kV OHL runs along corridor from E of Cefn-coch to Aberbechan	Existing 33kV OHL runs across corridor close to Llangadfan and the A458	Contains no known existing 33kV > OHL	Contains no known existing 33kV > OHL	Contains no known existing 33kV > OHL
Local Level Constraints	Local Nature Reserves	No	No	No	No	No	No	No	No	No
	Wildlife Trust Reserves	No	No	No	No	No	No	No	No	No
	Commercial Forestry (CF)	No	Yes	No	No	Yes	No	Yes	Yes	No
	CF Comments	All areas of existing CF avoided by corridor	Small areas of existing CF lie within corridor at Trwyn-y-bryn and E of Bry-y-Castell	All areas of existing CF avoided by corridor	All areas of existing CF avoided by corridor	Small areas of existing CF lies within corridor at Trwyn-y-bryn and E of Bry-y-Castell	All areas of existing CF avoided by corridor	Small area of existing CF lies within corridor E of Bry-y-Castell	Small areas of existing CF lie within corridor at Trwyn-y-bryn and E of Bry-y-Castell	All areas of existing CF avoided by corridor
	Ancient Woodland	No	No	No	No	No	No	No	No	No
	AW Comments	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	High Flood Risk Zone (FR)	No	No	No	No	No	No	No	No	No
	FR Comments	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Landscape Sensitivity		No Area classified as 'Outstanding'					No Area classified as 'Outstanding'			
	LANDMAP areas classified as High or Outstanding for Visual and Sensory aspect	Half of the corridor is classified as 'High' and half is classified as 'Moderate'	Over half of the corridor is classified as 'High', with a large proportion classified as 'Moderate' and a small area classified as 'Low'	Over half of the corridor is classified as 'Moderate', with a large proportion classified as 'High' and a small area classified as 'Low'	Half of the corridor is classified as 'High' and half is classified as 'Moderate'	Over half of the corridor is classified as 'High', with a large proportion classified as 'Moderate' and a small area classified as 'Low'	Half of the corridor is classified as 'High' and half is classified as 'Moderate'	Most of the corridor is classified as 'High' and small areas are classified as 'Moderate' or 'Low'	Most of the corridor is classified as 'High' and small areas are classified as 'Moderate' or 'Low'	Half of the corridor is classified as 'High' and half is classified as 'Moderate', with a small area classified as 'Low'
	LANDMAP areas classified as High or Outstanding for Historic Landscape aspect	Most of the route is evaluated as 'High', or 'Outstanding' except for the area around Pant-y-milwyr which is classified as Low and the area SE of Tregynon which is classified as Moderate	Most of the route is evaluated as 'High', or 'Outstanding' except for the area around Carreg-y-big which is classified as Low and the area SE of Tregynon which is classified as Moderate	Much of the route is evaluated as 'High', except for the valley NE of Tirymynach and E of Bwlch-y-ffridd which are classified as Moderate	Most of the route is evaluated as 'High', or 'Outstanding' except for the area around Pant-y-milwyr which is classified as Low and the area E of Bwlch-y-ffridd which are classified as Moderate	Most of the route is evaluated as 'High', or 'Outstanding' except for the area around Carreg-y-big which is classified as Low E of Bwlch-y-ffridd which are classified as Moderate	All of the route is evaluated as 'High', except for the area around Pant-y-milwyr which is classified as Low	All of the route is evaluated as 'High', except for the area around Carreg-y-big which is classified as Low	ALL of the route is evaluated as 'High', except for the area around Carreg-y-big which is classified as Low	Most of the route is evaluated as 'High', except for the area around Carreg-y-big which is classified as Low, and the valley NE of Tirymynach which is classified as Moderate

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	Landscape Sensitivity Rating (See Table 1: Levels and Definitions of Landscape Sensitivity)	Low	Medium	Medium	Low	Low	Low	Medium	Medium	Low
	Area of Corridor classified as Tranquil (Approx %) (from Wales Tranquil Areas Map 2009)	80%	90%	55%	50%	50%	80%	100%	100%	100%
	Comments	The majority of this broad route corridor is classified as Undisturbed (Wales Tranquil Areas Map), the area of the corridor close to the A458 is deemed to have some disturbance (Zone C)	The majority of this broad route corridor is classified as Undisturbed, the area surrounding the quarry at Cefn Coch is classified as Disturbed (Zone B)	Much of this broad route corridor is classified as Undisturbed, the area of the corridor close to the A470 is deemed to have some disturbance (Zone C)	Much of this broad route corridor is classified as Undisturbed, the area of Northwest of Newtown is deemed to have some disturbance (Zone C)	Much of this broad route corridor is classified as Undisturbed, the area of Northwest of Newtown is deemed to have some disturbance (Zone C)	The majority of this broad route corridor is classified as Undisturbed, the area of the corridor close to the A458 is deemed to have some disturbance (Zone C)	The entirety of this broad route corridor lies on high ground classified as Undisturbed	The entirety of this broad route corridor lies on high ground classified as Undisturbed	The entirety of this broad route corridor lies on high ground classified as Undisturbed
Visual Amenity	Theoretical Visibility from LANDMAP Significant view locations	Likely	Likely	Likely	Likely	Likely	Unlikely	Unlikely	Unlikely	Unlikely
	No. of Viewpoints	1	1	2	2	2	0	0	0	0
	Comments	Corridor theoretically likely to be visible to the N/E/S from Gregynog HPG, screening likely from deciduous and coniferous trees	Corridor theoretically likely to be visible to the N/E/S from Gregynog HPG, screening likely from deciduous and coniferous trees	Corridor theoretically likely to be visible to the S/SW/SE from Gregynog HPG and from Plas Dinam HPG to the N	Corridor theoretically likely to be visible to the S/SW/SE from Gregynog HPG and from Plas Dinam HPG to the N	Corridor theoretically likely to be visible to the S/SW/SE from Gregynog HPG and from Plas Dinam HPG to the N	n/a	n/a	n/a	n/a
	Public Footpaths with Corridor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Comments	A number of local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	A number of local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	A number of local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	A number of local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	A number of local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	Several local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	Several local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	Several local public footpaths pass through the corridor - any route in this corridor would cross public footpaths	Several local public footpaths pass through the corridor - any route in this corridor would cross public footpaths
	Notes on suitability for Wooden Pole Lines.	Wooden poles would be less visible, particularly in the upland, undisturbed sections	Wooden poles would be less visible, particularly in the upland, undisturbed sections	Wooden poles would be less visible, particularly in the upland, undisturbed sections	Wooden poles would be less visible, particularly in the upland, undisturbed sections	Wooden poles would be less visible, particularly in the upland, undisturbed sections	Wooden poles would be less visible, particularly in the upland, undisturbed sections	Wooden poles would be less visible, due to the upland, undisturbed nature of the corridor	Wooden poles would be less visible, due to the upland, undisturbed nature of the corridor	Wooden poles would be less visible, particularly in the upland, undisturbed sections
	Notes on suitability for Steel Tower Lines.	Steel towers would be significantly more visually intrusive in the open upland areas of the corridor, but could be accomodated throughout the east of the corridor	Steel towers would be significantly more visually intrusive in the open upland areas of the corridor, but could be accomodated throughout the east of the corridor	Steel towers would be significantly more visually intrusive in the open upland areas of the corridor, scope for existing line and new 132kV line to share steel tower E from Carno	Steel towers would be significantly more visually intrusive in the open upland areas of the corridor, but could be accomodated throughout the east of the corridor	Steel towers would be significantly more visually intrusive in the open upland areas of the corridor, but could be accomodated throughout the east of the corridor	Steel towers would be significantly more visually intrusive in the open upland areas of the corridor	Steel towers would be significantly more visually intrusive due to the open upland character of the corridor	Steel towers would be significantly more visually intrusive due to the open upland character of the corridor	Steel towers would be significantly more visually intrusive due to the open upland character of the corridor
	Comments	Wooden poles more suitable because less visible (and to minimise visual clutter with existing wooden pole OHL)	Wooden poles more suitable because less visible (and to minimise visual clutter with existing wooden pole OHL)	Wooden poles more suitable because less visible (and to minimise visual clutter with existing wooden pole OHL)	Wooden poles more suitable because less visible (and to minimise visual clutter with existing wooden pole OHL)	Wooden poles more suitable because less visible (and so minimise visual clutter with existing wooden pole OHL)	More suitable for wooden poles due to upland undulating characater and undisturbed nature of landscape.	More suitable for wooden poles due to upland undulating characater and undisturbed nature of landscape.	More suitable for wooden poles due to upland undulating characater and undisturbed nature of landscape.	More suitable for wooden poles due to upland undulating characater and undisturbed nature of landscape.
Residential Amenity	Residential Properties within Corridor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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	Comments	200+ residential properties within the corridor. Routeing difficult along corridor close to Four Crosses. Routeing possible to avoid all other properties & 100m buffer zone	120+ residential properties within the corridor. Routeing possible to avoid all properties & 100m buffer zone	60+ residential properties within the corridor. Routeing possible to avoid all properties & 100m buffer zone	170+ residential properties within the corridor. Routeing difficult along corridor close to Four Crosses. Routeing possible to avoid all other properties & 100m buffer zone	80+ residential properties within the corridor. Routeing possible to avoid all properties & 100m buffer zone	100+ residential properties within the corridor. Routeing difficult along corridor close to Four Crosses. Routeing possible to avoid all other properties & 100m buffer zone	Less than 10 residential properties within the corridor. Routeing possible to avoid all properties & 100m buffer zone	10-12 residential properties within the corridor. Routeing possible to avoid all properties& 100m buffer zone	12-15 residential properties within the corridor. Routeing possible to avoid all properties& 100m buffer zone
Length of Corridor	Approx. Length of Corridor (km)	37.28km	25.25km	26.51km	39.84km	28.02km	22.36km	10.10km	8.76km	14.76km
	Route Corridor Area (ha)	4958.39	3456.5	2580.16	1040.58	1040.58	2813.87	722.45	762.12	1366.55
Evaluation	**Broad Route Corridor**	**E1**	**E2**	**E3**	**E1a**	**E2a**	**F1**	**F2**	**F3**	**F4**
	Preferred Route Corridor		**Preferred Corridor**	**Preferred Corridor**					**Preferred Corridor**	**Preferred Corridor**
	Comments	The high number of changes in direction of potential routes within this corridor and the extended length of the corridor in comparison to other corridors make this corridor a less feasible option	This corridor takes a direct route across upland moorland avoiding settlements and major visual receptors. The large scale of the landscape within the western section of the corridor ensures there is a capacity for large infrastructure within this corridor	This corridor takes a route across upland moorland avoiding major ridges and has extensive opportunity for back clothing against coniferous woodland. The potential opportunity to share the existing 132kV line eastwards from Carno may reduce visual impact within the corridor.	The alterntive end route offered by this corridor does not significantly benefit any of the broad route corridors, and would increase the number of changes in direction required and subsequently result in an increased level of visual intrusion from the extra infrastructure required	The alterntive end route offered by this corridor does not significantly benefit any of the broad route corridors, and would increase the number of changes in direction required and subsequently result in an increased level of visual intrusion from the extra infrastructure required	The high number of changes in direction of potential routes within this corridor and the extended length of the corridor in comparison to other corridors make this corridor a less feasible option	This route corridor passes through the narrow valley close to Moel Ddolwen which would likely result in a significant impact on the residential properties found within the valley. The corridor would also require a high number of changes in direction of potential routes proposed within it	This corridor takes a direct route across upland moorland avoiding settlements and major visual receptors. The large scale of the landscape ensures there is a capacity for large infrastructure within this corridor	This corridor takes a route across upland moorland avoiding major ridges to the west of Cefn Coch and has extensive opportunity for back clothing against coniferous woodland. The large scale of the landscape ensures there is a capacity for large infrastructure within this corridor

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LLANBRYNMAIR WIND FARM
GRID CONNECTION

FIGURE 5.1

BROAD STUDY AREA

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary
- Llanbrynmair WF Area
- TAN 8 Strategic Search Area

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

LAND USE CONSULTANTS

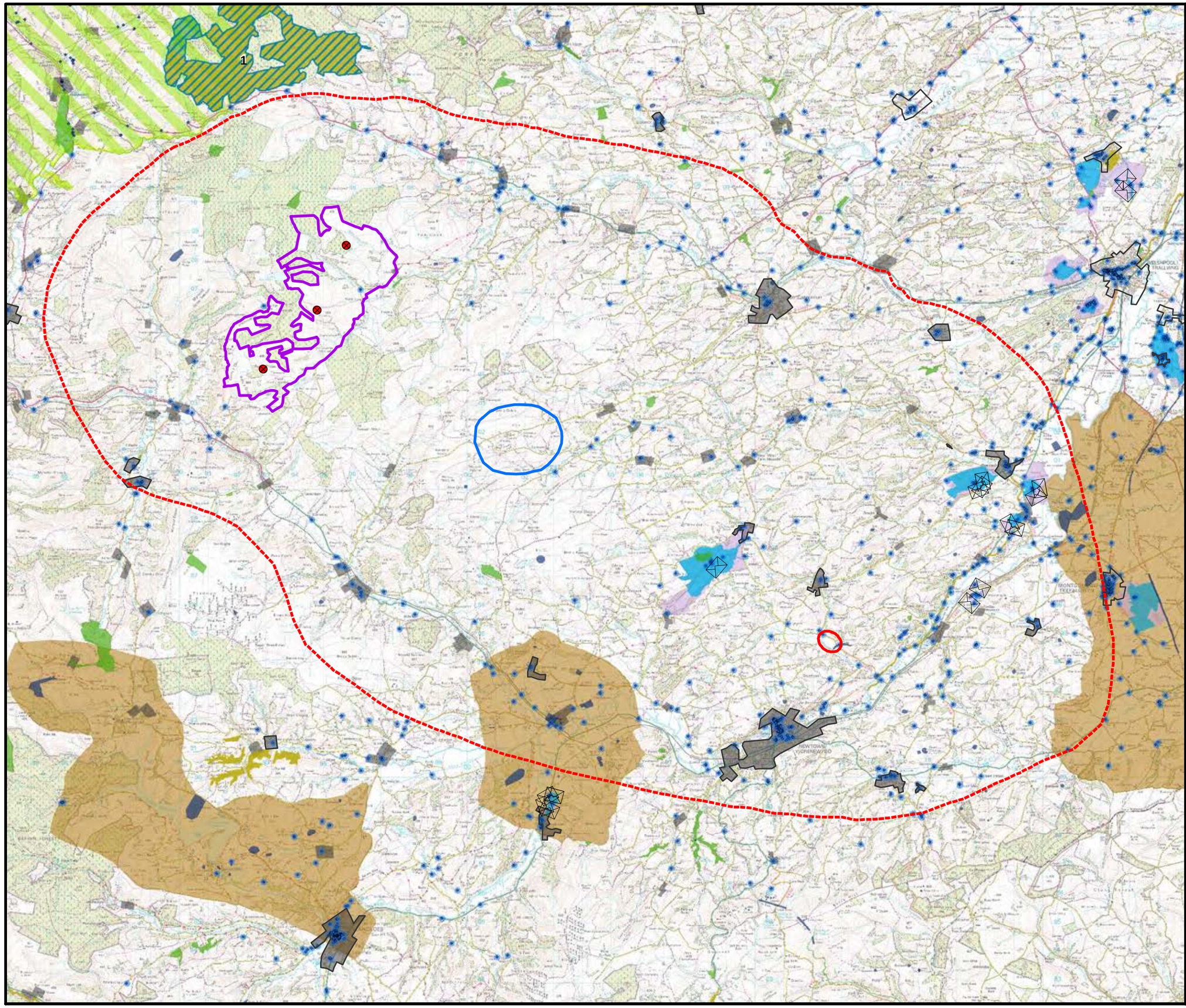
LAYOUT DWG | T-LAYOUT NO.

DRAWING NUMBER

4975-001-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT



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LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.2

AREAS OF HIGHEST ENVIRONMENTAL VALUE (DESIGNATIONS, SETTLEMENTS AND PROPERTIES)

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch
- Snowdonia National Park
- Sites of Special Scientific Interest (SSSIs)
- Special Areas of Conservation (SACs)
- Special Protection Areas (SPA)
  1. Berwyn
- Scheduled Monuments
- Historic Landscapes (HLs)
- Historic Parks
- Essential Setting of Historic Parks
- Significant views from Historic Parks
- Conservation Areas
- Listed Buildings
- Listed Buildings - 100m Buffer
- Settlements
- Residential Properties
- Residential Properties - 100m Buffer

LAND USE CONSULTANTS

LAYOUT DWG

T-LAYOUT NO.

DRAWING NUMBER

4975-002-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.3a

LANDMAP - AREA OF 'HIGH' AND 'OUTSTANDING' VALUE FOR LANDSCAPE HABITATS

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Landscape Habitats

- High
- Outstanding

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-003a-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.3b

LANDMAP - AREA OF 'HIGH' AND 'OUTSTANDING' VALUE FOR HISTORIC LANDSCAPES

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Historic Landscapes

- Outstanding
- High

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.
DRAWING NUMBER	
4975-003b-r1 06/10/2010	

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.3c

LANDMAP - AREA OF 'HIGH' AND 'OUTSTANDING' VALUE FOR VISUAL AND SENSORY

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Visual & Sensory

- Outstanding (no areas)
- High

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-003c-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.3d

LANDMAP - AREA OF 'HIGH' AND 'OUTSTANDING' VALUE FOR GEOLOGICAL LANDSCAPE

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Geological Landscape

- High
- Outstanding

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-003d-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.3e

LANDMAP - AREA OF 'HIGH' AND 'OUTSTANDING' VALUE FOR CULTURAL LANDSCAPE

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Cultural Landscape

- High
- Outstanding

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-003e-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.4

TOPOGRAPHIC TECHNICAL CONSTRAINTS

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Slope (degrees º)

- 0 - 15º
- 15 - 22º
- 22º >

Height (m)

- 0 - 300m
- 300 - 350m
- 350 - 400m
- 400 - 450m
- 450m >

LAND USE CONSULTANTS

LAYOUT DWG

T-LAYOUT NO.

DRAWING NUMBER

4975-004-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.5

TECHNICAL CONSTRAINTS EXISTING/PROPOSED WIND FARMS & GRID INFRASTRUCTURE (OVERHEAD + UNDERGROUND CONNECTIONS)

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch
- Mynydd Clogau (Existing Development)

Wind Farm Developments in Planning

- Llanbrynmair
- Mynydd Clogau
- Mynydd Waun Fawr
- Rhyd Ddu
- Tir Gwynt
- WF Turbine Buffer (3x Tip Height)
- Grid 033KV OHL
- Grid 033KV UG
- Grid 132KV OHL
- Grid 132KV UG

LAND USE CONSULTANTS

LAYOUT DWG

T-LAYOUT NO.

DRAWING NUMBER

4975-005-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.6

BROAD ROUTE OPTIONS TO SUBSTATION E

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Area

- Hub E - Aberbechan

Corridor

- E1
- E2
- E2/E3 Link
- E3
- E3a

LAND USE CONSULTANTS

LAYOUT DWG

T-LAYOUT NO.

DRAWING NUMBER

4975-006-r1 06/10/2010

SCALE - 1:125,000

GRID CONNECTION ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.7

BROAD ROUTE OPTIONS TO SUBSTATION F

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Area

- Hub F - Cefn Coch

Corridor

- F1
- F2
- F3
- F4

LAND USE CONSULTANTS

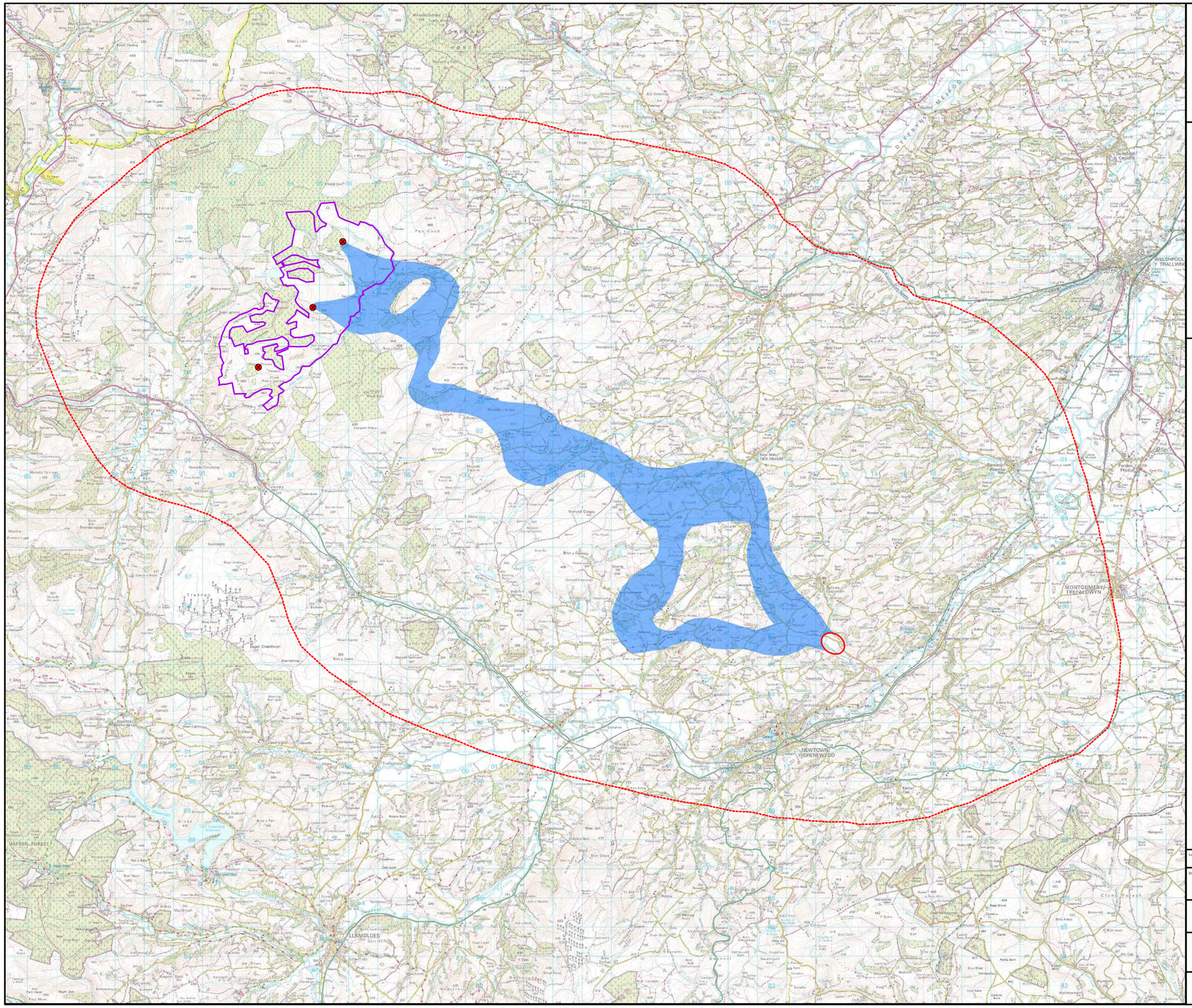
LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-007-r1 06/10/2010

SCALE - 1:60,000

GRID CONNECTION ASSESSMENT



LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.8

BROAD ROUTE CORRIDOR E2

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Area

- Hub E - Aberbechan

Broad Route Corridor

- E2

LAND USE CONSULTANTS

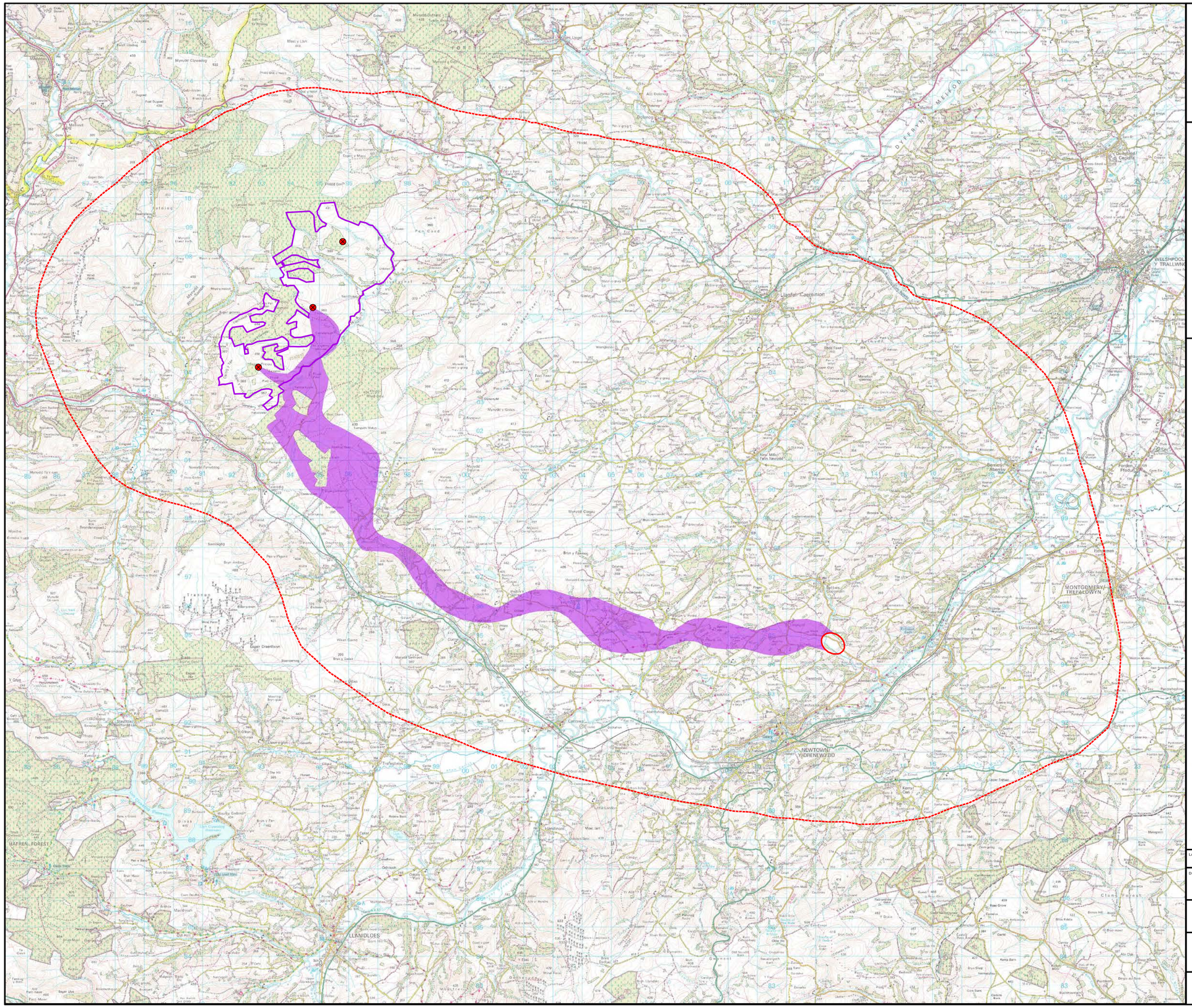
LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-008-r1 06/10/2010

SCALE - 1:65,000

GRID CONNECTION ASSESSMENT



LLANBRYNMAIR WIND FARM
GRID CONNECTION

FIGURE 5.9

BROAD ROUTE CORRIDOR
E3

LAND USE CONSULTANTS

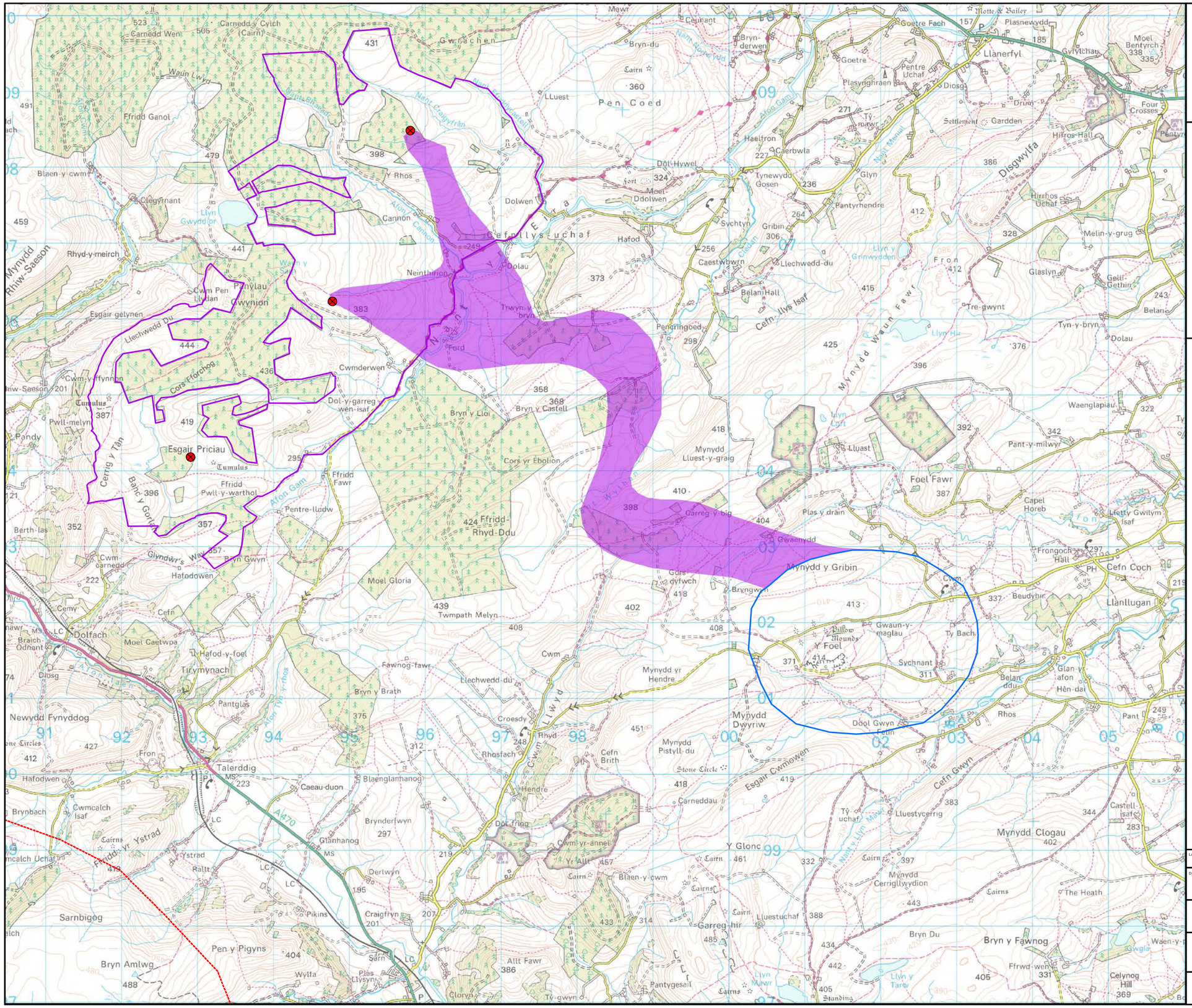
LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-009-r1 06/10/2010

SCALE - 1:65,000

GRID CONNECTION ASSESSMENT



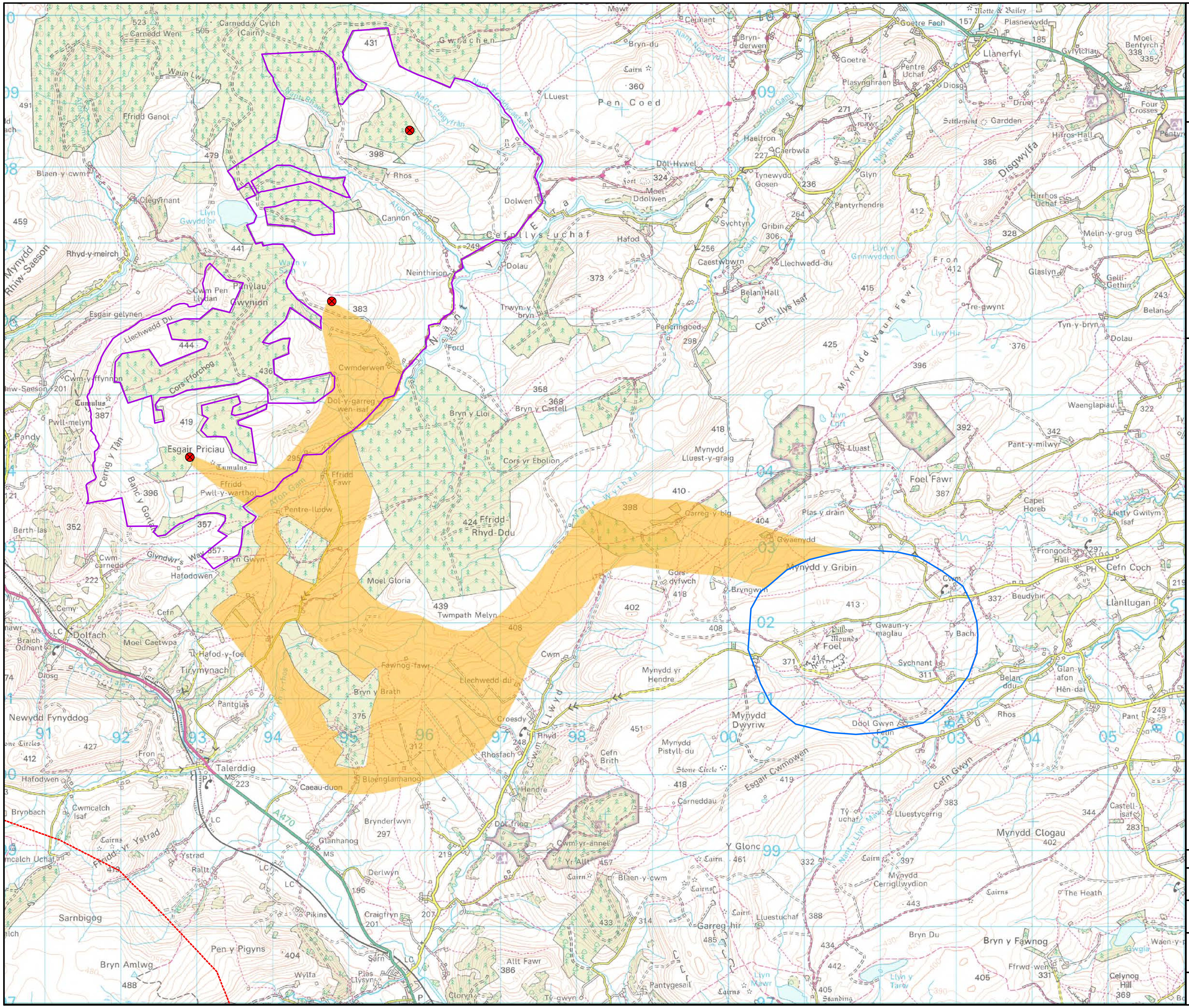
LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.10

BROAD ROUTE CORRIDOR F3

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.
DRAWING NUMBER	
4975-010-r1 06/10/2010	
SCALE - 1:25,000	
GRID CONNECTION ASSESSMENT	



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LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.11

BROAD ROUTE CORRIDOR F4

- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary
- Llanbrynmair WF Boundary

NG Substation Search Area

- Hub F - Cefn Coch

Broad Route Corridor

- F4

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-011-r1 06/10/2010

SCALE - 1:25,000

GRID CONNECTION ASSESSMENT

1.6 Grid Connection - Ecological Appraisal Report


Llanbrynmair Wind Farm Grid Connection:
Ecology Assessment
Prepared for RES UK & Ireland Ltd
by
Land Use Consultants
August 2011 V0.1
www.landuse.co.uk

LUC SERVICES

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CONTENTS

FIGURES

1 INTRODUCTION

1.1 Llanbrynmair Wind Farm is proposed on an area of Llanbrynmair Moors, within the *Technical Advice Note (TAN) 8: Planning for Renewable Energy* Strategic Search Area B (SSA B), Carno North. The Environmental Statement (ES) for the proposed wind farm was submitted to the Department for Energy and Climate Change (DECC) in April 2009 for a scheme comprising 43 proposed wind turbines. The grid connection was not assessed within the ES, as it will be the subject of a separate Section 36 (S36) application.

1.2 Llanbrynmair Wind Farm will require a connection to a 400Kv substation. It is proposed that Llanbrynmair (and other wind farm developments) will be connected to one of two National Grid (NG) substation search areas (E - Aberbechan and F - Cefn Coch). The connection for the Llanbrynmair Wind Farm will extend from one of three proposed onsite substations.

1.3 In 2010 a routeing study was undertaken by Land Use Consultants (LUC) to identify a number of environmentally and technically feasible broad route corridors which could be taken by grid infrastructure in order to link the proposed wind farm to a National Grid hub. This resulted in the identification of nine broad route options associated with the two NG substation search areas:

- **NG substation search area E (Aberbechan)** – Broad Route Options E1, E2 and E3, and links E3a and E2/E3.
- **NG substation search area F (Cefn Coch)** – Broad Route Options F1, F2, F3 and F4.

1.4 In 2011, LUC were commissioned to update the study to include further analysis of the ecological characteristics of the routes. This report presents the findings of this study.

Assumptions

1.5 This study was conducted on the assumption that the cable connection type will be overhead lines supported by wooden poles. These could be of various designs and the recommendations of this study would remain the same. It is recognised that where multiple connections from different wind farms come together, steel towers may be used instead of wooden poles, as a means of avoiding the need to double up on infrastructure.

2 METHODOLOGY

2.1 The methodology involved the review of a number of sources of publically available biological records to describe the ecological characteristics of the routes.

2.2 The Powys Local Biodiversity Action Plan was reviewed to provide background in terms of the local priorities for habitats and species in the area. No mapping of such features was available or reviewed for these purposes, although at a more detailed stage (once a route has been chosen) it would be appropriate to seek more detailed species data from the local records centre.

2.3 In addition the following data sources were reviewed:

- Internationally designated biodiversity sites available from CCW - including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar Sites (RSs).
- Nationally designated sites available from CCW - including Sites of Special Scientific Interest (SSSIs); National Nature Reserves (NNRs); and Local Nature Reserves (LNRs).
- Locally notified sites identified in the Powys Unitary Development Plan (UDP) - including Nature Conservation Sites of Regional and Local Importance and Local Wildlife Sites.
- Other habitat data available from CCW – including Phase 1 Habitat Mapping for Wales and Ancient Woodland.

2.4 Although the Phase 1 Habitat Mapping for Wales is relatively old (completed in 1997), it was considered that this would provide a useful indication of the habitats which may be present, particularly when used in combination with OS Base Mapping. Base mapping was also reviewed to provide an indication of topography and the location of watercourses.

3 FINDINGS

3.1 This section details the priority habitats and species within the Powys LBAP by means of background, with the ecological value specific to the route options then discussed further.

POWYS LOCAL BIODIVERSITY ACTION PLAN

3.2 The priority habitats and species identified under the Powys LBAP highlight the reflect the key landscape types within the local area, including acidic upland areas, lowland agricultural land use and river valleys. The priority habitats are detailed in **Table 3.1**, with the priority species and their broad habitat preferences listed in **Table 3.2**.

Table 3.1 LBAP Priority Habitats (Source: Powys LBAP)

Priority Habitat	Brief description
Upland Oak Woodlands	Upland woods on acidic soils with high rainfall. Tend to be dominated by sessile oak (*Quercus petraea*) but pedunculate oak (*Quercus robur*) and birch (*Betula* spp.) are also common. 10,000 ha in Powys.
Lowland Wood Pasture	Typically consists of large, open-grown or high forest trees, in a matrix of grazed grassland, heathland or woodland plants. Fifty-sites known in Powys.
Coniferous Woodland	Woodlands with a high proportion (80% or more) of coniferous species, both native and introduced, are a dominant habitat type in areas of Powys, with 40,700 hectares.
Wet Woodland	Wet woodlands generally occur as small pockets and remnants of habitat in river valleys, at the edges of bogs, mires and fields, and peaty hollows in larger woodlands. Conservative estimates put the amount of alder and willow woodland at 1700 ha for Powys.
Scrub and Ffridd	A very variable habitat, scrub may be defined as progressive or climax vegetation dominated by locally native shrubs, typically less than five metres tall, with a few scattered trees. Ffridd is a characteristic habitat at the periphery of the Welsh uplands between fenced in-bye land and open hill land. Typically a mosaic of bracken and gorse often with hawthorn, rowan and small areas of acid grassland.
Linear Habitats	Hedgerows, roadside verges, railway embankments and other linear features of value to wildlife (with the exception of rivers and streams and canals). Hedgerows are a characteristic feature of the Powys landscape, occurring in both lowland and upland situations.
Rivers and Streams	All running water habitats (rivers and streams) within Powys but excludes canals, farm ditches, and still waters such as lakes.
Mesotrophic Waters	Powys has a wide range of open waters ranging in nutrient status from the oligotrophic (nutrient poor) pools of the western, peat-covered uplands, to the relatively eutrophic

	(nutrient rich) waters of lowland sites.
Lowland Raised Bog	Powys has around 250 ha of lowland raised bog, most of it protected by designation.
Rhos Pastures	Wet, acid to neutral grasslands, on nutrient-poor mineral or peat soils; they often occur on low-lying valley bottoms, hillsides and commons. It is estimated that approximately 56,000 ha (24,000 ha of which is lowland) of purple moor-grass and rush pasture is present in the UK. Over half of this, about 35,000 ha, occurs in Wales. Powys supports about 3,600 ha, excluding the Brecon Beacons National Park, around 6% of the UK total.
Lowland Meadows	This action plan describes traditionally managed hay-meadows and pastures. Estimates from the CCW Phase II Lowland Grassland Survey put the area in Powys at 360 ha.
Lowland Dry Acid Grassland	Lowland dry acid grasslands typically occur on base-poor, free-draining soils, overlying acid rocks or superficial deposits such as sands and gravels.
Upland Calcareous Grassland	Upland calcareous grasslands occur on base-rich substrates above the upper limit of agricultural enclosure, which is usually 250-300 m. It is not a common vegetation type and usually occurs in mosaics with other upland communities. In Wales, the largest areas of calcareous grassland occur on the limestone of the Powys uplands, mainly in the Brecon Beacons National Park, which holds 60% of the Welsh resource.
Upland Lowland Heath	Upland heath is typically dominated by dwarf shrubs, with cover greater than 25%, and lies below the montane zone (at c. 600 - 750m) and above the upper limit of agricultural enclosure (250 - 300m). Lowland heath includes any below an altitude of about 300 m (limit of agricultural enclosure). In Powys, the community usually occurs on the lower slopes of hills where it forms part of an altitudinal zonation of vegetation types from valley bottom, to lowland heath, to upland heath.
Traditional Orchards	A plot of land on which fruit trees are cultivated. A decline in number of orchards across Wales was particularly severe in Powys.
Farmland	This plan aims to raise awareness of biodiversity issues and ways in which all farms can contribute to enhancing the Biodiversity of Powys.
Garden Habitat	Gardens can be small privately owned areas of land, often adjoining other similar areas as well as large formal gardens and Local Authority parks and gardens, and provide a vital link for people to learn about local wildlife.

Table 3.2 LBAP Priority Species (Source: Powys LBAP)

Priority Species	Habitat requirements
Red squirrel	Large areas of continuous pure coniferous woodland with a mixture of suitable coniferous species and a range of age-classes.
Brown hare	Mixed farming systems provide optimum conditions.
Water vole	Slow moving streams, rivers, canals, ditches and ponds, particularly those with lush bank-side vegetation.
Hazel dormouse	The hazel dormouse is heavily reliant on woodlands and ancient hedgerows.
Lesser horseshoe bat	Use a variety of roosts at different times of year, and are thought to fly three km or more from the roost and will typically forage in woodlands, hedgerows and tree lined riverbanks.
Pipstrelle bat	Often roost in buildings and forage Pipistrelles forage in varied habitats but woodland edges, hedgerows and waterways are particularly important.
European otter	Otters inhabit unpolluted river systems, lakes, marshes, streams, canals and sheltered coasts where there is a variety of fish species, eels and other suitable prey.
Lapwing	The lapwing was once a familiar farmland bird in Powys but now exists as a scarce and declining bird of mixed farmland and rushy pasture in lowland areas of each vice county of Powys.
Curlew	Curlews depend on open landscapes such as moorland, rough pasture, hay meadows and damp rushy pasture (rhos) during the nesting season. By August most curlews have deserted their breeding sites (to which they are faithful year in year out), to spend the winter in coastal areas.
Tree sparrow	The tree sparrow frequents cultivated land with trees, open woodland and other habitats with scattered trees or mature hedgerows.
Nightjar	The most important breeding habitats are lowland heathland and, increasingly, young forestry plantations.
Red kite	In Wales often associated with deciduous woodland, particularly upland oak woodland, bordering open ffridd; they also nest in lowland woods and parkland areas where they are more productive.
Great crested newt	Require still ponds, ditches etc. to breed and on land they are associated with rough grassland, scrub and woodland.
Allis shad and twaite shad	The status of allis shad within the Wye catchment is currently unknown, whilst records of twaite shad, either through Environment Agency monitoring or incidental sightings, are reasonably frequent.
Brown trout	Found most commonly in fast-flowing, unpolluted upland rivers and streams and also in stream-fed lakes.
River lamprey	The river lamprey is a migratory species, which grows to

	maturity in estuaries around Britain and in winter moves into fresh water to spawn in clean rivers and streams. The larvae spend several years in silt beds before metamorphosing and migrating downstream to estuaries and the sea.
White clawed crayfish	Typical habitats for white-clawed crayfish in Powys are fast flowing streams with a loose rocky substrate, where they are found beneath the boulders. They also seek shelter in tree roots within the stream or loose alluvial banks. Crevices within retaining stone walls of waterways, e.g. canals, are also favoured habitats. White clawed crayfish are known to inhabit standing waters in Powys.
Fairy shrimp	The only known extant population of fairy shrimp in Wales is at a single pool in Radnorshire. Fairy shrimp was also recorded at Penyclawdd, Monmouthshire in the 1970s.
High brown fritillary	South facing bracken-covered hillside is now the main remaining habitat in Wales for this species.
Pearl bordered fritillary	In Wales most populations are associated with south-facing bracken slopes or ffridd.
Marsh fritillary	In Wales the marsh fritillary breeds in damp neutral or acid grasslands (rhôs pastures). In Powys the butterfly occurs mainly on wet grassland habitats and occasionally damp flowery clearings in woodlands.
Red northern wood ant	The Welsh population is concentrated in the conifer plantations of north Wales and also in a few oak woodlands of Merioneth with an outlying population in Radnorshire.
Climbing corydalis weevil	The weevil inhabits clearings, rides and light-shaded areas of ungrazed woodland where it is associated with bracken and climbing corydalis.
Globeflower	Globeflower is particularly characteristic of tall herb communities on unimproved base-rich soil (calcareous, organic-peaty or clay soils), in mainly water margins, fen, wet grassland, damp hay meadows and woodland edges.
Wood bitter vetch	Wood bitter-vetch is primarily an upland species, usually found between 200 and 300m and most remaining sites are in Wales and north west Scotland. It is particularly characteristic of well drained old species-rich grassland and hay meadows in fertile, somewhat base-enriched soil.
Floating water plantain	Found in a range of freshwater situations, from upland lakes to lowland canals. The Montgomery Canal supports populations of floating water-plantain throughout its length and for this reason Montgomery Canal has been designated a cSAC.
Pillwort	Pillwort (Pilularia globulifera) is a small fern found on bare mud in slightly acid to neutral lakes, ponds and shallow pools, particularly at the margins.
Alien plant species	Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*).
Waxcap grasslands	Waxcap grassland is a term recently coined to describe

	nutrient-poor, regularly grazed or mown grassland with a short, well-drained turf that is rich in grassland fungi, particularly waxcap (Hygrocybe) species.
Slender green feather moss	Occurs in usually small patches in slightly basic flushes on upland and lowland sites, with Powys appearing to support a major concentration of sites.
River jelly lichen	The largest known Welsh population occurs in Powys in the River Irfon between Llangammarch Wells and its confluence with the Wye, and has been subject to outline survey jointly by the EA and CCW. Scattered populations are known to occur between Erwood and Hay on Wye.

ECOLOGICAL CHARACTERISTICS OF THE SEARCH AREAS

3.3 The biodiversity designations and habitats identified within the broad route options for the two search areas are illustrated in **Figures 3.1a-c** (Search area E), and **Figures 3.2a-b** (Search area F).

3.4 The ecological characteristics of the route options are detailed in **Table 3.3** (Search area E) and **Table 3.4** (Search area F).

Table 3.3: Ecological characterisation of Broad Route Options Associated with National Grid Substation Search Areas E - Aberbechan

Criterion	Broad Route Option E1	Broad Route Option E2	Broad Route Option E3	Broad Route Option E3a	Broad Route Option E2/E3
International biodiversity designations	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.
National biodiversity designations	Does not contain any SSSI, NNR or LNR.	The route overlaps very slightly with the Gweunydd Dolwen SSSI. A small part of the SSSI is located within the southern part of an east-west section of the route to the east of the Dolwen settlement and south of an existing road. This SSSI is designated for its acid and neutral dry grassland, and dense gorse scrub habitats. Given the small area of overlap with the route it should be possible to avoid impacts to this SSSI. Does not contain any NNR or LNR.	Does not contain any SSSI, NNR or LNR.	Does not contain any SSSI, NNR or LNR.	Does not contain any SSSI, NNR or LNR.
Local biodiversity designations	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.
Habitat description (CCW Phase 1 Habitat Mapping and OS mapping)	The section of Route E1 located between the wind farm site and Hub F is the same as Route F1. This section is therefore described below in Table 3.2. The remainder of this route which runs east from Hub F was predominantly recorded as improved grassland, comprising a predominantly agricultural landscape of pasture, hedgerows and treelines with numerous small, connected, linear woodlands and copses. These woodlands were largely recorded as broadleaved but also coniferous, and included both semi-natural and plantation. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire. The route also includes a number of watercourses, including the upper reaches of River Rhiw near Hub F, and the Bechan Brook south of Tregynon.	The majority of the section of Route E2 located between the wind farm site and Hub F is the same as Routes F2 and F3. This section is therefore described below in Table 3.2. The northern part of Route E2 also includes an additional area north of F3 and within F2, comprising a loop around a hill at Cefnllys-uchaf. Habitats were similar to those recorded within Route F3 to the south, including improved grassland, marshy grassland and coniferous woodland. It also included areas of broadleaved semi-natural woodland particularly along the Afon Gam and therefore likely to comprise wet woodland. An approximate 4km stretch of the Afon Gam is included within the north-west end of this route. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire. The remainder of the route between Hub F and Hub E is the same as Route E1 with lowland agricultural and woodland habitats recorded (see description for E1).	The north west section of this route is the same as Route F4 as described below. Route E3 runs to the south east from F4 near Rhyd. The remainder of the route passes through a predominantly lowland agricultural landscape dominated by improved grassland habitats. These areas also support numerous small, connected, linear woodlands and copses, and would also be likely to support frequent hedgerows. The woodlands were mostly deciduous and semi-natural, with an area of coniferous plantation spanning the route north east of Carno. Occasional small patches of semi-improved neutral grassland and acid grassland were also recorded along the route, with a large area of acid grassland recorded near Gwern-y-pwyll north of Llanwnog. The route also includes a number of watercourses.	Route E3a comprises a short section between E2 and E3 to the west of Hub F. This comprises part of Route F with habitats recorded including improved grassland and areas of acid grassland, acid flush and marshy grassland.	The northern section of the E2/E3 Link passes north-south between E2 and E3 west of Hub E, joining E3 near Bwlch-y-ffrid. This section of the link is located in a predominantly agricultural landscape supporting improved grassland. A number of linear semi-natural broadleaved woodland habitats were also recorded, although these appear to be a at a lower density than areas of E2 and E3. The area would also be likely to support frequent hedgerows. The remainder of this route runs east from Bwlch-y-ffrid to Hub E along Route E2 through agricultural habitats with improved grassland and linear woodland habitats (see description for E2).
Notable habitats	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Scrub and Ffridd Linear Habitats Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland
Species	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.

Table 3.4: Ecological characterisation of Broad Route Options Associated with National Grid Substation Search Areas F - Cefn Coch

Criterion	Broad Route Option F1	Broad Route Option F2	Broad Route Option F3	Broad Route Option F4
International biodiversity designations	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.	Does not contain any internationally designated biodiversity sites.
National biodiversity designations	Does not contain any SSSI, NNR or LNR.	The route overlaps very slightly with the Gweunydd Dolwen SSSI. A small part of the SSSI is located within the southern part of an east-west section of the route to the east of the Dolwen settlement and south of an existing road. This SSSI is designated for its acid and neutral dry grassland, and dense gorse scrub habitats. Given the small area of overlap with the route it should be possible to avoid impacts to this SSSI. Does not contain any NNR or LNR.	Does not contain any SSSI, NNR or LNR.	Does not contain any SSSI, NNR or LNR.
Local biodiversity designations	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.	No local designations were identified within the Powys Unitary Development Plan, including Nature Conservation Sites of Regional and Local Importance, and Local Wildlife Sites. No Wildlife Trust Reserves were identified either.

Habitat description (CCW Phase 1 Habitat Mapping and OS mapping)	The majority of the route is located within improved grassland habitats. These habitats are associated with lowland agricultural land uses and are associated with other agricultural habitats such as hedgerows. Other habitats include small patches of woodland, including coniferous plantation and broadleaved plantation and semi-natural woodlands. The west part of the route, within and near to the wind farm, includes large areas recorded as marshy grassland associated with upland areas, and localised bracken, with small areas of acid grassland and dry heath habitats within the edge of the route near Pen Coed. The eastern part of the route also passes within the vicinity of upland habitats along the ridge at Disgwylfa although only small areas of acid grassland, heath and marshy grassland habitats are recorded within the route itself at Pant-y-Milwyr. This route also includes a number of watercourses. The central part of the route crosses and/or follows the Afon Banwy at several locations. The south east section of the route includes a relatively long section of the Afon Einion and its tributaries, which are in turn tributaries of the Afon Banwy. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.	The north west section of this route is largely located within improved grassland habitats with small patches of other habitats such as marshy grassland and coniferous plantation. The central part of the route is dominated by areas of marshy grassland, acid grassland and coniferous plantation. These are likely to be associated with more upland and acidic habitats, with small patches of dry heath located in the vicinity (although not within) this part of the route. The south east part of the route is dominated by improved and marshy grassland habitats. This route includes a number of watercourses. Approximately 1.5km of the northern part of the route follows the Afon Cam. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.	The north west section of this route was mostly recorded as marshy grassland and improved grassland habitats. One large area of coniferous plantation recorded at Trwyn-y-Bryn almost spans the width of the route. The central part of the route is dominated by areas of marshy grassland, acid grassland and coniferous plantation. These are likely to be associated with more upland and acidic habitats, with small patches of dry heath located in the vicinity (although not within) this part of the route. The south east part of the route is dominated by improved and marshy grassland habitats. This route includes a number of watercourses. The Afon Gam spans the width of the route in the north east. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.	Improved grassland and marshy grassland was recorded within a relatively large proportion of this route. Habitats recorded within this route also included a relatively large area of upland habitats compared to other routes in Search Area F. These included acid grassland habitats within the north east of the routes in the vicinity of the turbine locations. The central area of the route included a particularly large expanse of acid grassland, with areas of wet heath, acid flush and bracken habitats. This route also enclosed, although does not include, areas recorded as coniferous plantation, with a single large area of coniferous plantation included in the southern part of the route near Gors-Dyfwch. This route includes a number of watercourses, including the upper reaches of The Afon Gam. Habitats within the vicinity of Hub F at Mynydd y Gribin include upland heathland habitats such as dry heath, wet heath, acid grassland and a small area of basin mire.
Notable habitats	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland	No Ancient Woodland sites were identified within the route. Powys BAP Habitats which may be associated with this route include: Wet Woodland Coniferous Woodland Scrub and Ffridd Linear Habitats Rivers and Streams Rhos Pastures Lowland Meadows Lowland Dry Acid Grassland Upland Lowland Heath Farmland
Species	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to bats given the dense network of linear woodlands and likely hedgerows, and riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to riverine fauna including fish, water vole and otter.	A broad range of protected and notable species could be located within this route. At this stage it is not possible to provide meaningful guidance without detailed ground surveys. However, in this route particular issues may arise in relation to riverine fauna including fish, water vole and otter.

4 FINDINGS

4.1 The above analysis identifies no major constraints associated with any of the route options in terms of biodiversity designations either at the international, national or local designations. A single SSSI, Gweunydd Dolwen, has a small area included within Route Options E2 and F2. However, it should be highly possible to site the route in such a way as to avoid impacts on this Site.

4.2 Given the above, assuming sensitive siting of the final cable routes and implementation of mitigation, it would be possible to accommodate the infrastructure within any of the routes whilst avoiding significant ecological impacts.

4.3 However, certain habitats identified within the routes from CCW Phase I Habitat mapping are of a greater value and therefore wherever possible impacts on these should be avoided or minimised. Particularly valuable habitats identified included:

- Upland habitats, including acid grassland and heath (wet and dry) habitats with a small area of basin mire identified at Hub F. Such habitats are of specific value in their own right, but also support a variety of notable species including botanic, invertebrate and ornithological interest.
- Woodland habitats, including semi-natural and plantation woodlands of value in their won right (particularly broadleaved semi-natural woodland) and given their potential value for a range of notable species including red squirrel, dormouse and range of bird species. No ancient woodland was identified within the study area which is of particular value given the nature of the habitats these support.
- Lowland agricultural habitats where these support a high density of linear habitat features particularly woodlands and hedgerows. These features provide potential habitat for notable species including as movement and foraging corridors, particularly bat species (including lesser horseshoe bat a local priority species) and dormouse. These also provide potential habitat for notable bird species such as tree sparrow.
- Rivers and watercourses given the value of these habitats for a range of protected and notable species, including otter, water vole and brown trout (many of the other LBAP priority species identified have a very restricted distribution and would be less likely to be affected by proposals). This habitat is also particularly sensitive to indirect impacts associated with construction, such as siltation, although direct impacts can be avoided through sensitive siting of support poles.

4.4 This is not to say that there are not additional areas of valuable habitats within these routes (such as ffrid, rhos pasture and lowland meadows), however it is not necessarily to identify these through a study at this scale. This would require more detailed, site surveys of the selected route, with sensitive siting of infrastructure to avoid or minimise impacts.

4.5 In addition to the above sensitive habitats, a general principle is that the shorter the route the lower the potential impact given a reduced area which would be affected by proposals.

4.6 On this basis, the favoured routes would be associated with Hub F given the greatly reduced infrastructure length. Furthermore, of these options Route Options F2 and F3 would result in minimal impacts on upland habitats, although there are large areas of conifer plantation on the route. Route Option F4 would minimise the potential for impacts on woodland habitats whilst careful siting and/or mitigation may be required to avoid or minimise impacts on heathland habitats. Finally, Route F1 although considerably longer mostly comprises improved grassland habitats with relatively few other habitat features (such as linear woodland) although with greater potential for impacts on watercourses, particularly Afon Banwy.

4.7 Of the longer infrastructure routes to Hub E, Route Option E3 would appear to have much greater potential to impact on extensive areas of lowland habitat supporting particularly dense networks of linear woodlands and hedgerows. This would potential result in greater levels of fragmentation for species of bat and other wildlife including dormouse and farmland birds. A grid route through the lowland components of Route Options E1 and 2 would result in similar impacts although potentially to a lesser degree given fewer areas with high densities of linear woodlands and hedgerows.

4.8 Of the links, Route Option E2/E3 would result in similar fragmentation impacts to linear woodlands, while E3a would have the potential to impact on upland habitats without appropriate siting and mitigation.

4.9 In terms of impacts on species, it is not appropriate to provide a greater level of detail in a study of this scale although the analysis of habitat impacts can provide an indication as discussed.

4.10 Once a Route Option has been selected, ground based ecological surveys will be required to identify the habitats currently present, their condition, suitability for protected and notable species, and the presence/absence of such species. As stated previously, with careful siting and the development of mitigation it should be possible to avoid or minimise ecological impacts associated with any of these Route Options.

Phase 1 Habitat Type

- Acid dry dwarf shrub heath
- Semi-improved acid grassland
- Unimproved acid grassland
- Acid/neutral flush/spring
- Basin mire fen
- Broadleaved plantation woodland
- Semi-natural broadleaved woodland
- Coniferous plantation woodland
- Continuous bracken
- Dry heath/acid grassland mosaic
- Improved grassland
- Marsh/marshy grassland
- Mixed plantation woodland
- Semi-improved neutral grassland
- Recently-felled coniferous woodland
- Running water
- Dense/continuous scrub
- Standing water
- Wet dwarf shrub heath
- Wet heath/acid grassland mosaic
- Other

Gweunydd Dolwen SSSI

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.12a

BROAD ROUTE OPTIONS TO SUBSATION E: BIODIVERSITY DESIGNATIONS AND PHASE 1 HABITAT MAPPING

- Sites of Special Scientific Interest (SSSIs)
- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary

NG Substation Search Areas

- Hub E - Aberbechan
- Hub F - Cefn Coch

Corridor

- E1
- E2
- E2/E3 Link
- E3
- E3a

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.
DRAWING NUMBER	
4975-02_002-r1 25/08/2011	
SCALE - 1:40,000	
ECOLOGICAL ASSESSMENT	

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.12b

BROAD ROUTE OPTIONS TO SUBSATION E: BIODIVERSITY DESIGNATIONS AND PHASE 1 HABITAT MAPPING

Sites of Special Scientific Interest (SSSIs)

Llanbrynmair WF Substation Locations

Broad Study Area Boundary

NG Substation Search Areas

Hub E - Aberbechan

Hub F - Cefn Coch

Corridor

E1

E2

E2/E3 Link

E3

E3a

LAND USE CONSULTANTS

LAYOUT DWG

T-LAYOUT NO.

DRAWING NUMBER

4975-02_003-r1 25/08/2011

SCALE - 1:40,000

ECOLOGICAL ASSESSMENT

Phase 1 Habitat Type

- Acid dry dwarf shrub heath
- SI Semi-improved acid grassland
- Unimproved acid grassland
- Acid/neutral flush/spring
- Basin mire fen
- Broadleaved plantation woodland
- Semi-natural broadleaved woodland
- Coniferous plantation woodland
- Continuous bracken
- Dry heath/acid grassland mosaic
- Improved grassland
- Marsh/marshy grassland
- Mixed plantation woodland
- SI Semi-improved neutral grassland
- Recently-felled coniferous woodland
- Running water
- Dense/continuous scrub
- Standing water
- Wet dwarf shrub heath
- Wet heath/acid grassland mosaic
- Other

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.12c

BROAD ROUTE OPTIONS TO SUBSATION E: BIODIVERSITY DESIGNATIONS AND PHASE 1 HABITAT MAPPING

Sites of Special Scientific Interest (SSSIs)

Llanbrynmair WF Substation Locations

Broad Study Area Boundary

NG Substation Search Areas

Hub E - Aberbechan

Hub F - Cefn Coch

Corridor

E1

E2

E2/E3 Link

E3

E3a

LAND USE CONSULTANTS

LAYOUT DWG

T-LAYOUT NO.

DRAWING NUMBER

4975-02_003-r1 25/08/2011

SCALE - 1:40,000

ECOLOGICAL ASSESSMENT

Phase 1 Habitat Type

- Acid dry dwarf shrub heath
- Semi-improved acid grassland
- Unimproved acid grassland
- Acid/neutral flush/spring
- Basin mire fen
- Broadleaved plantation woodland
- Semi-natural broadleaved woodland
- Coniferous plantation woodland
- Continuous bracken
- Dry heath/acid grassland mosaic
- Improved grassland
- Marsh/marshy grassland
- Mixed plantation woodland
- Semi-improved neutral grassland
- Recently-felled coniferous woodland
- Running water
- Dense/continuous scrub
- Standing water
- Wet dwarf shrub heath
- Wet heath/acid grassland mosaic
- Other

Phase 1 Habitat Type

- Acid dry dwarf shrub heath
- Semi-improved acid grassland
- Unimproved acid grassland
- Acid/neutral flush/spring
- Basin mire fen
- Broadleaved plantation woodland
- Semi-natural broadleaved woodland
- Coniferous plantation woodland
- Continuous bracken
- Improved grassland
- Marsh/marshy grassland
- Mixed plantation woodland
- Semi-improved neutral grassland
- Recently-felled coniferous woodland
- Running water
- Dense/continuous scrub
- Standing water
- Wet dwarf shrub heath
- Wet heath/acid grassland mosaic
- Other

Gweunydd Dolwen SSSI

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.13a

BROAD ROUTE OPTIONS TO SUBSATION F: BIODIVERSITY DESIGNATIONS AND PHASE 1 HABITAT MAPPING

- Sites of Special Scientific Interest (SSSIs)
- Llanbrynmair WF Substation Locations
- Broad Study Area Boundary

NG Substation Search Areas

- Hub F - Cefn Coch

Corridor

- F1
- F2
- F3
- F4

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-02_004-r1 25/08/2011

SCALE - 1:40,000

ECOLOGICAL ASSESSMENT

LLANBRYNMAIR WIND FARM GRID CONNECTION

FIGURE 5.13b

BROAD ROUTE OPTIONS TO SUBSATION F: BIODIVERSITY DESIGNATIONS AND PHASE 1 HABITAT MAPPING

Sites of Special Scientific Interest (SSSIs)

Llanbrynmair WF Substation Locations

Broad Study Area Boundary

NG Substation Search Areas

Hub F - Cefn Coch

Corridor

F1

F2

F3

F4

LAND USE CONSULTANTS

LAYOUT DWG	T-LAYOUT NO.

DRAWING NUMBER

4975-02_004-r1 25/08/2011

SCALE - 1:40,000

ECOLOGICAL ASSESSMENT

Phase 1 Habitat Type

- Acid dry dwarf shrub heath
- Semi-improved acid grassland
- Unimproved acid grassland
- Acid/neutral flush/spring
- Basin mire fen
- Broadleaved plantation woodland
- Semi-natural broadleaved woodland
- Coniferous plantation woodland
- Continuous bracken
- Improved grassland
- Marsh/marshy grassland
- Mixed plantation woodland
- Semi-improved neutral grassland
- Recently-felled coniferous woodland
- Running water
- Dense/continuous scrub
- Standing water
- Wet dwarf shrub heath
- Wet heath/acid grassland mosaic
- Other