MYNYDD Y GAER WIND FARM

Flood Consequence Assessment and Conceptual Drainage Strategy

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FCA
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Quality Management

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J. Morley 16 January 2025

Prepared by:

RPS Consulting Services Ltd

4th Floor, 1 Newhall Street
Birmingham, B3 3NH

Prepared for:

Cenin Renewables

Contents

Tables

Figures

Appendices

1 INTRODUCTION

Project Brief

1.1 RPS was commissioned to prepare a Flood Consequence Assessment (FCA) in relation to the proposed development of c. 11 no. wind turbines on land at Mynydd y Gaer Bridgend, CF35 6NH.

Assessment Procedure

1.2 The aim of the FCA is to outline the potential for the site to be impacted by flooding, the impacts of the Proposed Development on flooding in the vicinity of the site, and the proposed measures which could be incorporated into the development to mitigate the identified risk.

1.3 The report has been prepared in accordance with the guidance detailed in the Planning Policy Wales Edition 12 (PPW12) and Technical Advice Note 15 (TAN15): Development and Flood Risk. Reference has also been made to the CIRIA SuDS manual (C753), BRE Digest 365 Soakaway Design, the Bridgend Flood Risk Management Plan and the Bridgend County Borough Council Preliminary Flood Risk Assessment.

1.4 This report has been prepared in consultation with the Natural Resource Wales (NRW) and the Lead Local Flood Authority (LLFA). The site is not located within an Internal Drainage Board (IDB) District.

1.5 This report is not intended to provide formal details of the final drainage design for the development. However, it provides information regarding the capabilities of the conceptual surface water drainage strategy to meet the requirements of the PPW12.

1.6 The desk study was undertaken by reference to information provided / published by the following bodies:

- Natural Resource Wales (NRW);
- Bridgend County Borough Council (BCBC);
- Rhondda Cynon Taf County Borough Council (RCTCBC);
- British Geological Survey (BGS);
- DataMapWales; and
- Ordnance Survey (OS).

2 PLANNING POLICY

Planning Policy Wales Edition 12, 2024

2.1 Planning Policy Wales Edition 12 sets out the land use planning policies of the Welsh Government. Chapter 6 – Distinctive and Natural Places outlines the Welsh Government's objectives in terms of addressing water and flood risk.

2.2 Section 6.6 of Planning Policy Wales addresses water and flood risk. The relevant guidance is summarized below:

- The planning system should:
  - protect and improve water resources and quality by promoting and encouraging increased efficiency and demand management of water as part of new developments, particularly in those areas where water resources may be under pressure or may not be available and where failure of water quality standards needs to be addressed;
  - ensure that the infrastructure networks, including nature based solutions on which communities and businesses depend is adequate to accommodate proposed development, and takes into consideration the impacts of climate change, so as to minimise risk to human health and the environment and prevent pollution at source; ensure sustainable drainage systems are an integral part of design approaches for new development; and ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals.
- Water resources and quality must be taken into account from an early stage in the process of identifying land for development and redevelopment. The protection of water resources should be based on ensuring sustainable use in the future. Meeting short term needs should be balanced against ability to protect water resources over the long term. This may mean that the location of new development, and its type, requires careful consideration. Water intensive uses may not be appropriate in areas of water shortage and constraint.
- New development should be located and implemented with sustainable provision of water services in mind, using design approaches and techniques which improve water efficiency149 and minimise adverse impacts on water resources, including the ecology of rivers, wetlands and groundwater and thereby contributing towards ecological resilience.
- Planning authorities should secure better management of drainage and surface water so as to tackle these issues by:
  - ensuring sustainable drainage systems are incorporated into development enabling surface water to be managed close to or at source; and
  - ensuring connection to the sewer in sewered areas and by minimising the proliferation of private sewage systems.

2.3 New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres also require approval from the SuDS Approval Body (SAB) before construction can commence. Adoption and management arrangements, including a funding mechanism for maintenance of SuDS infrastructure and all drainage elements are to be agreed by the SAB as part of this approval. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.

2.4 The provision of SuDS must be considered as an integral part of the design of new development and considered at the earliest possible stage when formulating proposals for new development. In guiding new development the planning system should at the very least ensure the incorporation of measures at an individual site scale, particularly in urban areas, in order to secure cumulative benefits over a wider area. A concerted effort of this nature will bring benefits over a whole

catchment. At a development plan level, however, there will be considerable advantages associated with developing collaborative approaches which, drawing on evidence obtained through green infrastructure assessments, integrate SuDS as part of growth strategies for particular areas.

2.5 Planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers. Surface water flooding will affect choice of location and the layout and design of schemes, and these factors should be considered at an early stage in formulating development proposals.

2.6 Development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.

2.7 In areas of flood plain currently unobstructed, where water flows in times of flood, built development should be wholly exceptional and limited to essential transport and utilities infrastructure. Such infrastructure should be designed and constructed so as to remain operational even at times of flood, to result in no net loss of floodplain storage, to not impede water flows and to not increase flood risk elsewhere. TAN 15: Development and Flood Risk should be referred to for further policy advice on development and flood risk. It will be important to note that developments located within flood risk areas remain at risk from flooding even if mitigation measures are applied.

2.8 Development should not cause additional run-off, which can be achieved by controlling surface water as near to the source as possible by the use of SuDS. Care should be taken in places of shallow groundwater or where flooding is caused by combined surface and groundwater processes. In such situations direct infiltration SuDS may not be appropriate. Consultation with drainage bodies and NRW should be undertaken, and relevant evidence and information drawn from Area Statements taken into account.

2.9 The ability of emergency services to respond to flood events should be taken into account when considering if a development in a flood risk area is appropriate. This may involve consultation with emergency planners, local resilience forums and other professional partners such as fire rescue, police and ambulance services.

2.10 Planning Policy Wales is supplemented by a series of Technical Advice Notes (TAN). TAN15 provides technical guidance on development and flood risk.

Technical Advice Note (TAN) 15: Development and Flood Risk

2.11 TAN 15 provides technical guidance to supplement the policy set out within Planning Policy Wales in relation to development and flooding. The guidance relates to sustainability principles and provides a framework to allow risks arising from river flooding, coastal flooding and additional run off from developments to be assessed.

2.12 In relation to flood risk, TAN 15 indicates that the Assembly has a duty to ensure that development is sustainable and does not create problems for future generations. Managing flooding has an important role to ensure sustainable development by guiding developments to locations with little or no risk from river, tidal or coastal flooding, managing consequences of flooding where developments can be justified and making provision for climate change.

2.13 TAN 15 confirms that each planning authority in Wales must prepare a Development Plan for its area. The development plans provide locational guidance for development, detailed site-specific policies, and identification of proposals for development. Catchment Flood Management Plans aim to take a holistic approach to flood management at a catchment scale and can provide guidance on managing risk to future developments. The information provided in local development plans and catchment flood management plans will aid with the application of the Justification Test.

Requirements of TAN 15

2.14 A FCA, to support a development application, should be proportionate to the risk and appropriate to the scale, nature and location of the development. The following will need to be considered:

- The consequences of flooding on the development, the consequences of the development on flood risk elsewhere and if appropriate mitigation measures can be incorporated into the design.
- Mechanisms of flooding, including sources of floodwater, how floodwater enters and flows across a site, height, and speed of floodwaters.
- Uncertainties in estimating flood events including use of historical records and forecasting.
- Security of Proposed Developments over their lifetime and ensuring those using the development have an awareness of the potential risks from flooding.
- Description of consequences under a range of extreme events including mechanisms, sources, depths, speed, rate of rise, overland flood routes, velocity, access and egress, impacts on natural heritage, impact on flood risk in surrounding areas.
- Structural adequacy of defences to contain flows and withstand overtopping and if required the suitability of implementing a buffer zone adjacent to defences.
- Measures required to ensure flooding is managed to acceptable levels and ensure that the impact upon flood risk elsewhere in the flood plain is managed.

TAN15 updates

2.15 Updates to TAN15 have been suspended due to a further consultation on the TAN. These include updated modelling to incorporate the risk of climate change in Fluvial/Tidal Flood Zones. As well as the addition of Surface Water and Small Watercourses Flood Zones which also incorporate climate change.

2.16 This update takes precedent over current guidance as it provides more recent modelling, and the guidance will be in force following completion of the development. Therefore, although current guidance is referenced the updated guidance has been followed within this report.

Local Planning Policy

Local Development Plan

2.17 The Site lies within the administrative boundary of Bridgend County Borough Council (BCBC) which is the LPA. The Replacement Local Development Plan 2018-2033 was adopted in March 2024.The following policies and objectives are relevant to flood risk and drainage:

SP4: Mitigating the Impact of Climate Change

[…] Directing development away from flood risk areas and avoiding development that increases the risk of flood and coastal erosion, including through the deployment of sustainable urban drainage systems where relevant.

DNP9: Natural Resource Protection and Public Health

[..] All development in flood risk areas must be supported by a Flood Consequences/Risk Assessment and incorporate any mitigation measures required to avoid or manage increased flood risk.

SOBJ 4 To Protect and Enhance Distinctive and Natural Places

[…] OBJ 4c Ensure adequate water supply, sewerage and drainage infrastructure (including sustainable drainage systems)

OBJ 4e To manage development in order to avoid or minimise the risk and fear of flooding and enable and improve the functionality of floodplains

Preliminary Flood Risk Assessment

2.18 The Bridgend County Borough Council Preliminary Flood Risk Assessment aims at providing a high level overview of flood risk from all sources of flooding within the local area, including consideration of surface water, groundwater and ordinary watercourses. Relevant information has been referenced throughout this report.

Flood Risk Management Plan

2.19 The Bridgend Flood Risk Management Plan assesses the risk of flooding within the administrative area of Bridgend and identifies options to manage risk to acceptable level. Relevant information from the FRMP has been reproduced throughout this FCA report.

Climate Change Allowances

2.20 Updated TAN 15 provides flood zones which incorporate climate change allowances for fluvial, coastal (tidal) and surface water and ordinary watercourses. Details are provided below.

2.21 The TAN 15 incorporates the 'central estimate' climate change allowances.

2.22 Table 1 below presents the anticipated increase in peak river flows for the Western Wales River Basin, and Table 2 presents the expected change to Extreme Rainfall Intensity. The climate change allowances are based on UKCP09 and emerging UKCP18 research data.

Table 1. Peak River Flow Allowances by River Basin District (use 1961 to 1990 baseline)

River Basin District	Allowance Category	Total potential change anticipated for '2020s' (2015-2039)	Total potential change anticipated for '2050s' (2040-2069)	Total potential change anticipated for the '2080s' (2070-2115)
Western Wales	Upper Estimate	25%	40%	75%
	Central Estimate	15%	25%	30%

Table 2. Change to Extreme Rainfall Intensity Compared to a 1961-90 Baseline

Change to Extreme Rainfall Intensity			
Applies across all of Wales	**Total potential change anticipated for '2020s' (2015-2039)**	**Total potential change anticipated for '2050s' (2040- 2069)**	**Total potential change anticipated for the '2080s' (2070-2115)**
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	20%

2.23 Runoff and attenuation calculation for the drainage design will take into account the above climate change allowances.

3 CONSULTATION

Natural Resource Wales

3.1 Consultation was undertaken with NRW in December 2024. A response was received in January 2025. NRW provided general information relating to flood maps, historical flooding, and flood data. They confirmed they do not hold records of groundwater flooding. The response is provided in Appendix A, and the information provided has been used in the production of this report.

Bridgend County Borough Council

3.2 Consultation was undertaken with BCBC, a response was received in January 2025. The full response is included as Appendix B.

Rhondda Cynon Taf County Borough Council

3.3 As the site runs adjacent to RCTCBC's administrative area, RCTCBC were consulted in December 2024. A response is currently awaited.

Internal Drainage Board

3.4 The site is not located within an IDB District.

Planning and Environment Decisions Wales (PEDW)

3.5 PEDW were consulted in March 2023 regarding the proposed development at Mynydd y Gaer. A Scoping Decision was provided in August 2023. As discussed within the scoping report and related decision, matters relating to flood risk and deterioration of waterbodies will be covered within this FCA. Construction work and decommissioning work will be conducted in line with the Construction Environmental Management Plan (CEMP) and Decommissioning Environmental Management Plan (DEMP), which will be produced when a contractor for the works is appointed and will submit to the relevant bodies for approval. Comments relating to the presence of peat at the site and the impact of the development upon hydrogeology will be covered within the Geology/Hydrogeology and Land/Soils ES Chapters.

4 SITE DESCRIPTION

Site Description

4.1 The Assessment Area occupies approximately 319 hectares (ha) and is centred around National Grid Reference SS953862.The site location is presented in Figure 1.

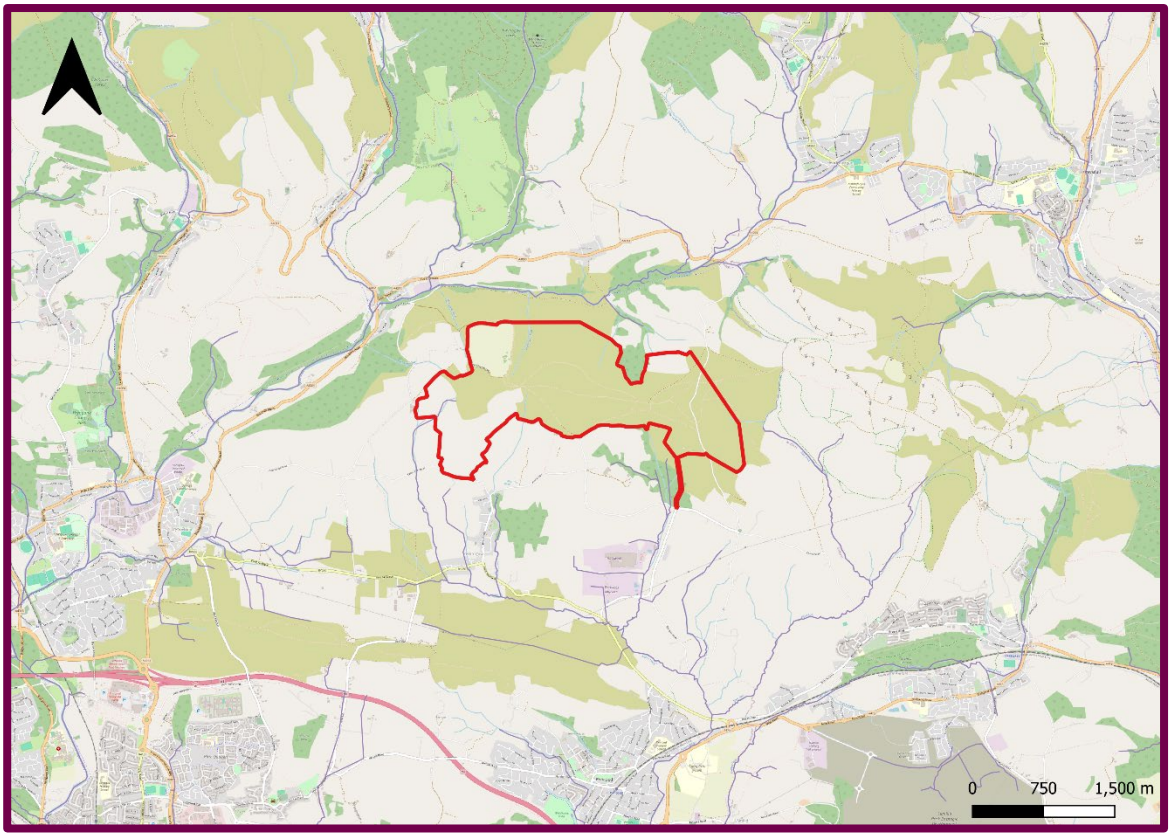


Figure 1. Site Location

4.2 The site is located north of the M4 motorway and the village of Heol y Cyw, which lies approximately 5 miles from Bridgend.

4.3 The site comprises mainly grassland agricultural fields.

Surrounding Land Uses

4.4 Blackmill Woodlands is located 100m west of the site. This is designated as a Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC).

4.5 Brynna a Wern Tarw is located 25m south of the site. This is designated as a SSSI.

4.6 There are no Special Protection Areas (SPA), within the vicinity of the site.

Topography

4.7 LiDAR data for the site indicates that levels range from approximately 100m AOD, at the southernmost point of the access road, to approximately 295m AOD in the vicinity of the proposed Turbines 3 and 6.

Site Observations

4.8 A site visit was undertaken on 23rd August 2022 to assess the proposed locations of the turbines and observe any additional flood risk issues.

4.9 Locations of the proposed turbines for the development proposals at the time were observed. Details of the observations are provided within a technical note (ref: HLEF83507 - Mynydd y Gaer Wind Farm Technical Note R v1 20220915), which is provided in Appendix C.

5 PROPOSED DEVELOPMENT

5.1 The proposed development comprises the construction and operation of up to 11no. wind turbines and associated infrastructure including; substation switches, access tracks and turning heads, borrow pits, temporary construction compounds (including holding bays), crane pads, underground cabling, drainage works and biodiversity proposals including creation, enhancement and restoration.

5.2 The Technical Advice Note 15 (TAN 15) classifies the proposed use as 'Less vulnerable development' with regard to flood risk.

5.3 Development plans are shown in Appendix D. The key components of the scheme are as follows:

Turbines

5.4 Two types of turbine are proposed on site, V150 and V162.

Grid Connection

5.5 The grid connection is proposed south of the development, west of Heol y Cyw. The grid connection is shared with the Ty'n y Waun Solar Farm, as part of the Bridgend Energy Hub.

Access tracks and turning heads

5.6 The Proposed Development comprises the construction, operation, maintenance and decommissioning of on-site surfaced tracks providing access to the wind turbines, onsite substation compound and temporary construction compounds from the local highway network.

5.7 Most of the on-site access tracks would be required to facilitate the construction of the Proposed Development. Additionally, a number of access tracks will be retained after construction in order to facilitate maintenance activities during the operational phase.

Borrow pits

5.8 Borrow pits will be excavated to provide fill materials required for construction of the Proposed Development, such as the on-site access tracks, wind turbine foundations and landscaping areas.

Temporary construction compounds and holding areas

5.9 The compound would be used, where necessary, for temporary storage of the various components and materials which are required for construction.

5.10 The temporary construction compounds will be reinstated at the end of the construction phase. The stored subsoil and the stored topsoil would be laid over the underlying stone surface and then reseeded using a seed mix selected or, where possible, turfs would be reinstated.

Crane pads

5.11 Permanent crane hardstanding (pads) as well as temporary lay down areas will be constructed to facilitate the cranes required for the erection of turbine components. To provide stable, firm ground for safe operation of the cranes, areas of hardstanding would be laid down on one side of each turbine foundation.

6 HYDROLOGICAL SETTING

Nearby Watercourses

6.1 OS maps and NRW data shows that the following waterbodies are located within the vicinity of the proposed development;

- Nant Crymlyn situated in the south west of the site;
- Nant Caner-Mawr in the north of the site;
- Ogwr Fach to the north of the site;
- Nant Caner-Bach to the north west of the site;
- Nant Cwm-Dwr to the north west of the site; and,
- Nant Ciwic to the south east of the site.

6.2 Several unnamed ordinary watercourses are also present within the site boundary

Water Framework Directive (WFD) Waterbodies

6.3 The Site falls into the following WFD catchments, which have the following classifications:

Table 3. Water Framework Directive Catchments

Name (WFD ID)	Management Catchment	Operational Catchment	Waterbody type	Overall Water Body	Ecological/ Quantitative	Chemical
Ewenny – headwaters to conf with the Ewenny Fach (ID: GB110058026290)	Tawe to Cadoxton	Ogmore	River (4993 ha catchment area)	Good	Good (Ecological)	High
Ogwr Fach - headwaters to confluence with Ogmore (ID: GB110058026310)	Tawe to Cadoxton	Ogmore	River (6539 ha catchment area)	Good	Good (Ecological)	High
Ogmore - Ogwr Fach and Ogwr Fawr conf to Llynfi conf (ID: GB110058026300)	Tawe to Cadoxton	Ogmore	River (2613 ha catchment area)	Good	Good (Ecological)	High
Swansea Carboniferous Coal Measures (ID: GB41002G201000)	Tawe to Cadoxton GW	Swansea Carboniferous Coal Measures	Groundwater (196911 ha catchment area)	Poor	Good (Quantitative)	Poor

Fluvial/Coastal Flood Risk Classification

Development Advice Mapping

6.4 The Welsh Assembly Government produces Development Advice Maps (DAM) to accompany TAN 15. These maps show the degree of flood risk which is to be applied to the Site for the planning

process and thus establish the suitability of the site for development. These maps are based upon the NRW flood maps and similarly they can be modified through the presentation of data (i.e. hydraulic modelling) to illustrate that a site is within a different flood zone. The development advice zones are listed below, alongside their attributed planning actions:

6.5 The development advice zones are listed below, alongside their attributed planning actions:

- **Zone A**: Areas considered to be at little or no risk of fluvial or tidal/coastal flooding. Flood risk within this zone does not need to be considered further.
- **Zone B**: Areas known to have been flooded in the past evidenced by sedimentary deposits. Areas within this zone are further checked against the 0.1% flood level.
- **Zone C1**: Based on 0.1% flood outline and are areas of the floodplain developed served by significant flood defence infrastructure.
- **Zone C2**: Based on 0.1% flood outline and areas of the floodplain without significant flood defence infrastructure.

6.6 The Development Advice Map, shown in Figure 2, indicates that the site is wholly located within Zone A.

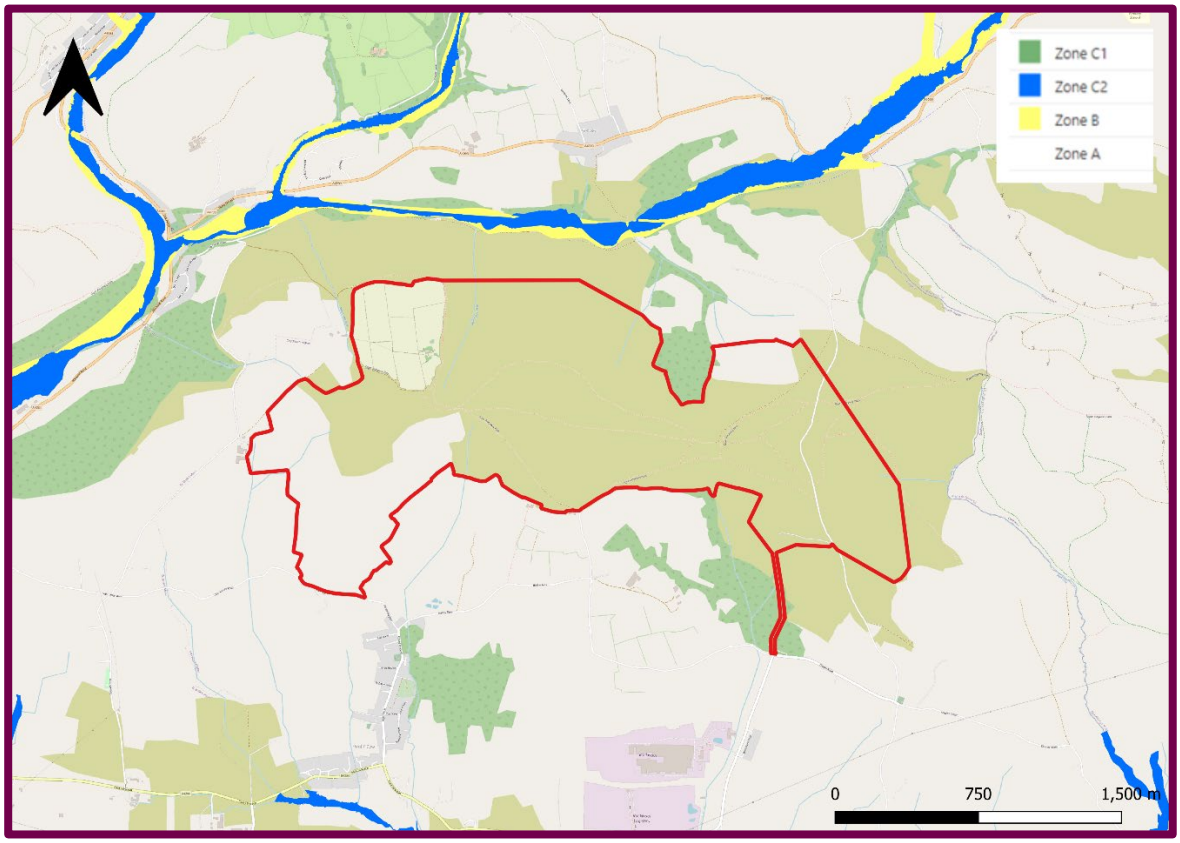


Figure 2. NRW Development Advice Map

6.7 The revised TAN15 is supported by the new Flood Map for Planning (FMfP), which includes climate change information to show how this will affect flood risk extents over the next century. It shows the potential extent of flooding assuming no defences are in place.

6.8 The climate change data is taken from the 'central estimate' epochs and as such is considered an appropriate assessment of future risk of the Proposed Development in line with TAN15 guidance.

6.9 Flood Zones are divided into the following categories:

- Flood Zone 1 (Rivers) are areas with a less than 0.1% (1 in 1000) chance of flooding from rivers each year, including the effects of climate change.
- Flood Zone 2 (Rivers) are areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers each year, including the effects of climate change.
- Flood Zone 3 (Rivers) are areas with more than 1% (1 in 100) chance of flooding from rivers each year, including the effects of climate change.

6.10 The FMfP for Rivers is presented within Figure 3 and shows that the site is entirely within Flood Zone 1.

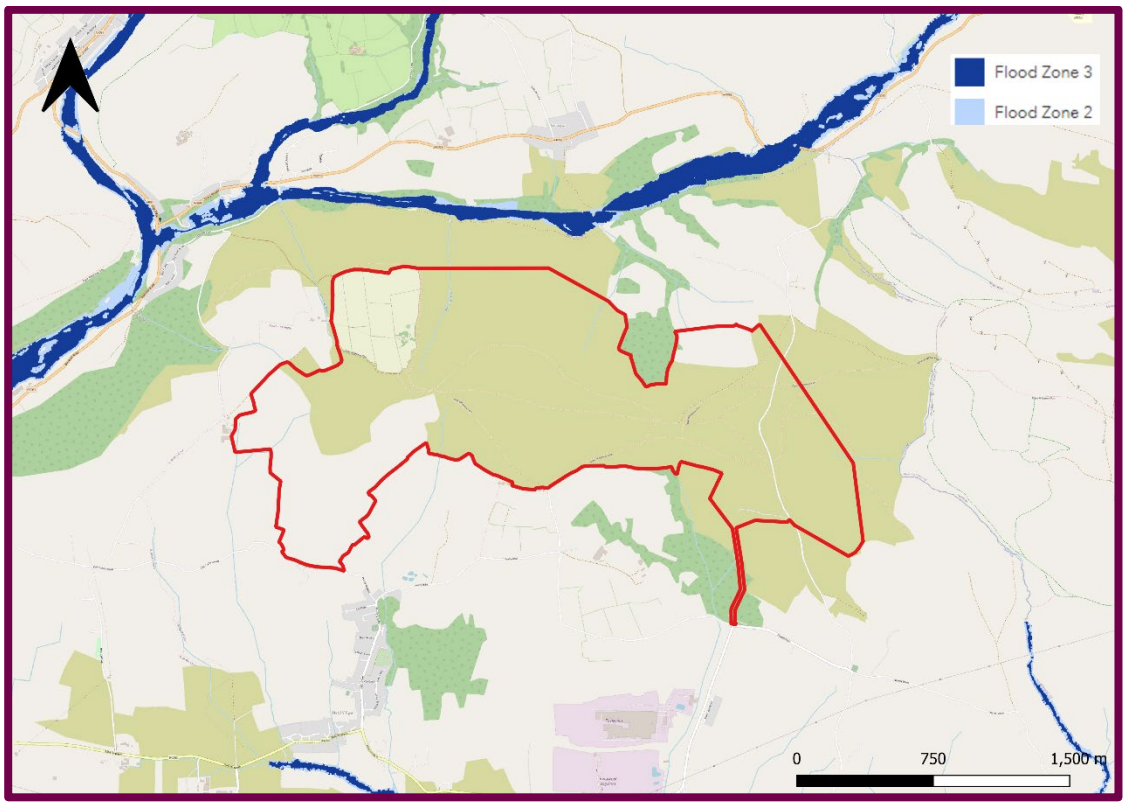


Figure 3. NRW Flood Map for Planning (Rivers)

6.11 The site is located significantly inland and therefore is not at risk from sea flooding.

Flood Warnings

6.12 The Data Map for Wales indicates that the site is not located within a Flood Warning area.

Flood Defences

6.13 The Data Map for Wales indicates there are no flood defences at the site or within its immediate vicinity.

Historical Flood Events

6.14 The Data Map for Wales indicates that the site is not located within historic recorded flood extents.

6.15 The NRW has been consulted for additional, up-to-date information relating to the fluvial/tidal flood risk to the site. A formal response regarding detailed information is pending at the time of this report.

Surface Water Flood Risk Classification

6.16 The Flood Risk from Surface Water and Small Watercourses classifications are divided into the following categories:

- **'High' risk** – areas which have a chance of flooding greater than 1 in 30 year (3.3%);
- **'Medium' risk** – areas which have a chance of flooding between 1 in 100 year (1%) and 1 in 30 (3.3%);
- **'Low' risk** – areas which have a chance of flooding between 1 in 1000 year (0.1%) and 1 in 100 year (1%); and,
- **'Very low' risk** – areas which have a chance of flooding less than 1 in 1000 year (0.1%).

6.17 NRW surface water mapping shows that most of the site is not at risk of surface water flooding. Areas of 'low' to 'high' risk have been identified within the extent of the site boundary. This is attributed to ordinary watercourses at the site and depressions in the ground surface.

6.18 The Flood Risk Map from Surface Water and Small Watercourses is presented within Figure 4.

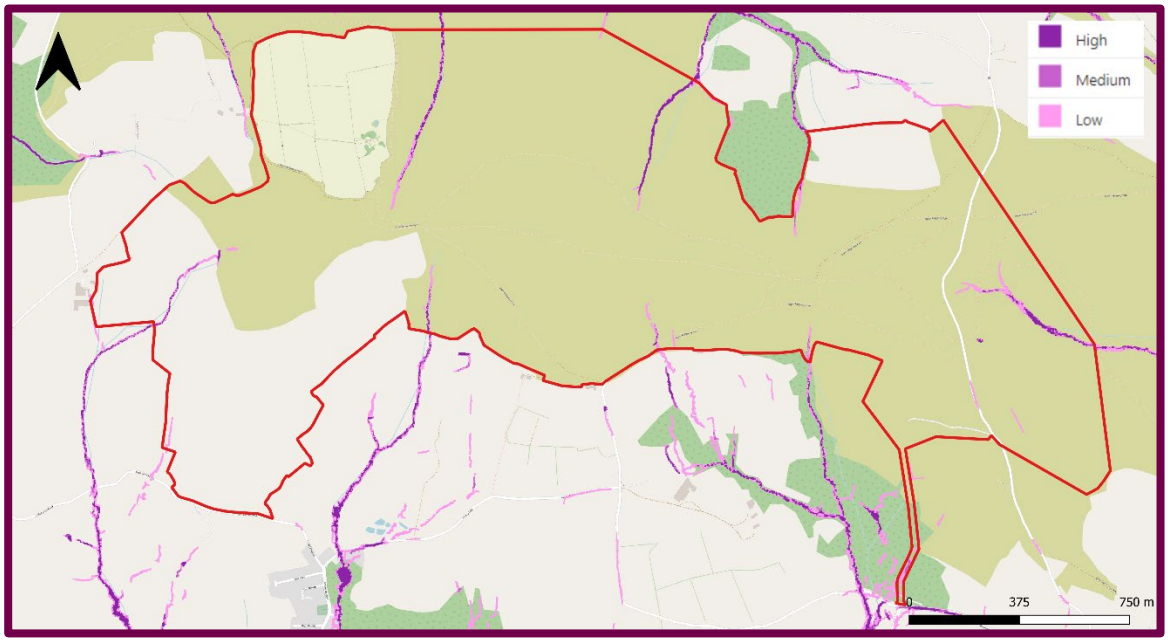


Figure 4. NRW Flood Map for Planning (Surface Water and Small Watercourses)

6.19 As indicated by Figure 5 below, at the location of the wind turbines no risk has been identified. There are some areas of access track which falls with the flood extents. It is anticipated that these extents are associated with small watercourses, or areas of low topography.

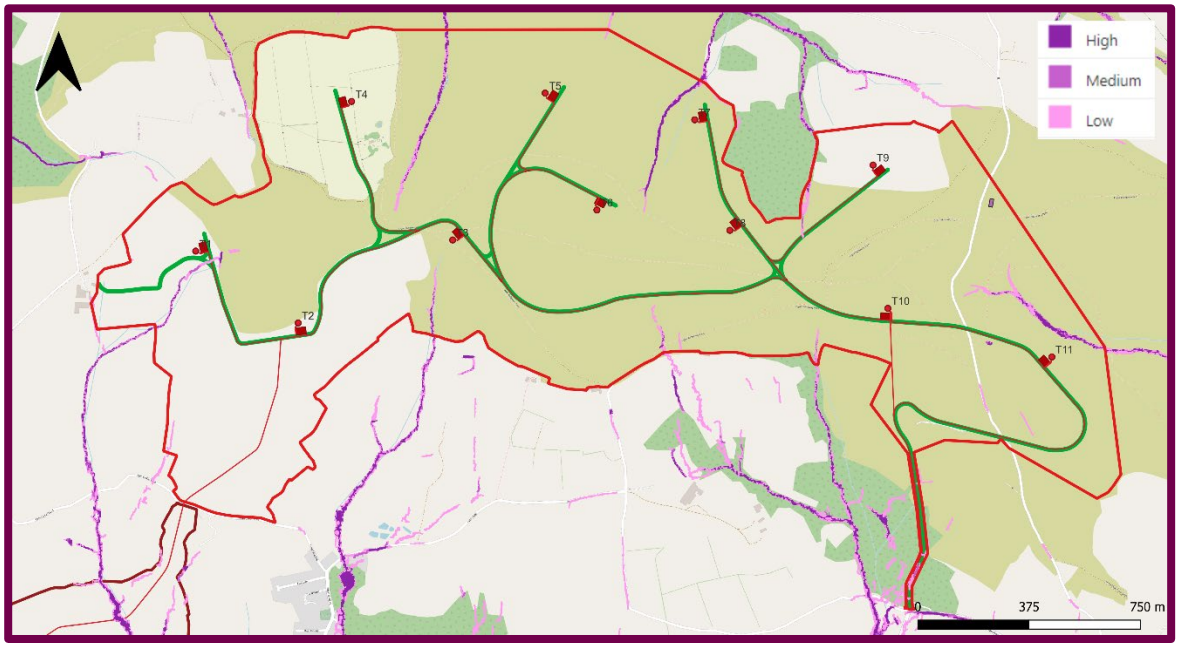


Figure 5. NRW Flood Map for Planning (Surface Water and Small Watercourses) and Development Locations

TAN15 Future Risk

6.20 The NRW's new FMfP includes Flood Zones for surface water and small watercourses with consideration for climate change and how it will affect flood risk extents over the next century.

6.21 The updated mapping is displayed in Figure 6. This indicates areas of Flood Zone 3 and 2, these extents are similar to the above and are associated with the extent of ordinary watercourses at the site. The extents do not encroach the proposed locations of the turbines.

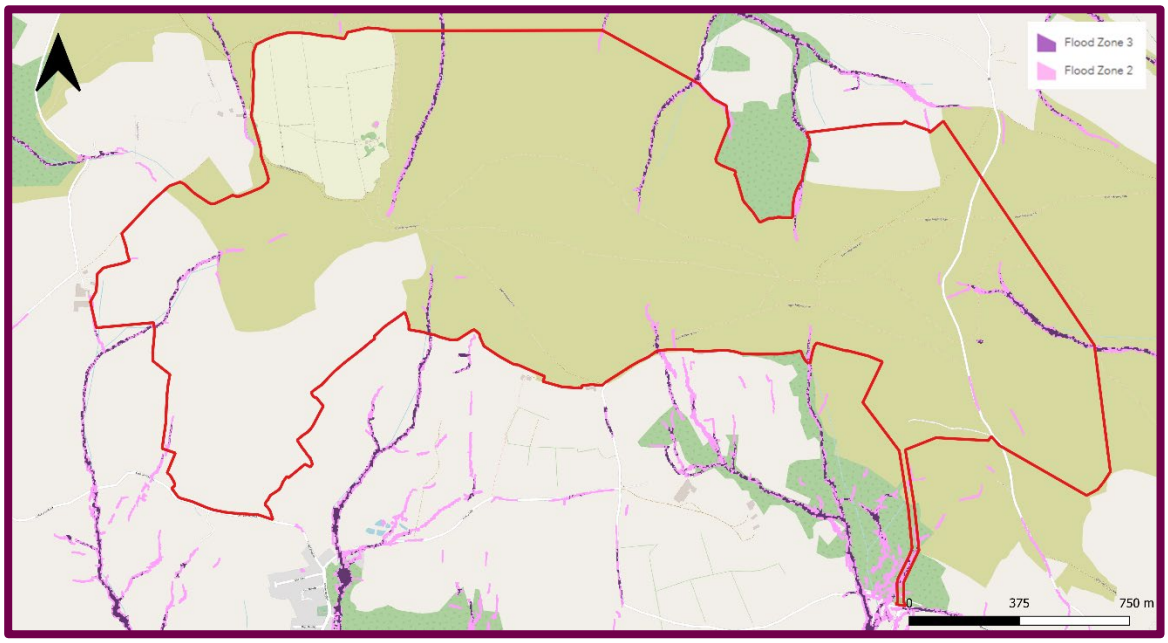


Figure 6. NRW Flood Map for Planning (Surface Water)

Reservoir Flooding

6.1.1 NRW FMfP shows the site is not located within the reservoir flood risk extent.

7 HYDROGEOLOGICAL SETTING

Geology

7.1 BGS Geology Viewer (1:50,000 scale) shows the majority of the site does not have any recorded superficial deposits. Peat is recorded in an isolated area at the west of the site, and Till (Devensian) deposits are recorded in the east of the site.

7.2 Large areas of the site are underlain by bedrock from the Rhondda Member, and the Brithdir Member, comprising sandstone. The Rhondda Member underlies isolated areas, comprising mudstone, siltstone and sandstone.

Aquifer Designation

7.3 BGS Aquifer Designation mapping shows bedrock deposits are categorised as a Secondary A Aquifer which generally support water supply and base river flow on a local scale. The underlying superficial geology deposits are classified as Secondary A Aquifers and Secondary Undifferentiated. Secondary Undifferentiated Aquifers have varying characteristics in different locations.

7.4 BGS Aquifer Designation mapping shows the superficial deposits as being Secondary (undifferentiated) and Unproductive.

Surface Protection Zones

7.5 The NRW natural environment mapping shows the site is not located within a Source Protection Zone.

Soils Classification

7.6 The Cranfield Soil and Agrifood Institute Soilscapes mapping shows soils within the site boundary fall under the following classifications:

- Soilscape 13 - Freely draining acid loamy soils over rock
- Soilscape 16 - Very acid loamy upland soils with a wet peaty surface, with surface wetness
- Soilscape 19 - Slowly permeable wet very acid upland soils with a peaty surface, with impeded drainage.

Water Resources

7.7 Information provided by Fluid Environmental Consulting indicates that there are several spring and stream fed catchments within the vicinity of the proposed development. These catchments are used to feed several private water supplies in the area. The Private Water Supply Assessment Map is included as Appendix E.

8 FLOOD RISK, WATERBODIES AND MITIGATION

8.1 The key sources of flooding that could potentially impact the site are discussed below:

WFD Waterbodies

8.2 All watercourses seek to achieve ‘Good’ status. Surface water flows from the Site will discharge into the local water environment. It is key to ensure that the Proposed Development will not impact this detrimentally and prevent ‘Good’ status from being achieved. The WFD waterbodies within the vicinity of the development have a WFD status of ‘Good.’

8.3 The underlying groundwater has a WFD status of ‘Poor.’ The bedrock has minor value as an aquifer. There are no water abstraction licenses active within 1km of the site. It is unlikely that the presence of the development and associated activities will impact the receptor.

8.4 The construction phase of the development has the potential to lead to the deterioration of water quality in ‘Main Rivers’ and ordinary surface watercourses. It is anticipated that potential construction impacts relating to water quality, resources and flood risk can be managed by the implementation of appropriate construction practices.

8.5 Based on the nature of the Proposed Developments and potential associated impacts, a Construction Environmental Management Plan (CEMP) will be prepared and submitted with the application. The CEMP would include industry good practice measures to ensure prevention of contaminated water run-off from all construction areas.

8.6 The Construction Drainage Strategy will incorporate pollution prevention and flood response measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable during the construction stage. Such measures would be implemented through the CEMPs and associated Construction Method Statements, as set out within the Environmental Statement.

Fluvial / Tidal Flooding

8.7 The development area is restricted to Zone A/Flood Zone 1. ‘Less vulnerable’ developments are considered acceptable within this zone – this will ensure the risk is appropriately mitigated.

8.8 In accordance with Land Drainage (Wales) Byelaws, no persons shall, without the consent of NRW deposit or store objects or matters within 8m of the edge of drainage, watercourse and flood risk management features. No work will be conducted within 8 m of non-tidal water bodies unless agreed with the relevant drainage authority, or NRW.

8.9 Mitigation measures to minimise any potential adverse effects on surrounding watercourses, flood risk levels, and agricultural land during construction will be ascertained at detailed design stage. Consent from NRW for any works within 8m of non-tidal waterbodies will also need to be obtained prior to construction.

Flooding from Sewers

8.10 The greenfield nature of the site means that sewer flooding does not pose a risk to the proposed development.

Surface Water Flooding (Overland Flow)

8.11 The NRW Flood Risk from Surface Water map indicates the majority of the site is located at 'very low’ risk of flooding. However, the mapping identifies several areas of risk that are associated with ordinary watercourses and areas of low topography.

8.12 These areas are not located in the proposed locations of turbines; therefore it is anticipated that the Proposed Development will not interfere with the existing surface water runoff regime.

8.13 The residual effect of the Proposed Development on flood risk is therefore considered to be negligible. The wind farm will be safe for its lifetime, taking account of the limited number of users of the site, with no increase in flood risk elsewhere.

Other Sources

8.14 Due to the type of development proposed, the Site is assessed to have a very low risk of flooding from groundwater, sewers and reservoir flooding. No mitigation measures are considered necessary.

9 SURFACE WATER MANAGEMENT

Introduction

9.1 The development will introduce impermeable areas comprising turbine hardstanding areas, and an access track, for the maintenance of the site.

9.2 Based upon the requirement set out by BCBC, a 30% increase in peak rainfall intensity has been included as a climate change allowance.

Greenfield Runoff Rate

9.3 The greenfield nature of the site means that surface water will slowly soak into the ground (infiltrate), be intercepted by vegetation or run off by way of overland flow, according to the soil characteristics and following the topography of the site. The greenfield runoff rate per hectare (ha) for the proposed impermeable areas have been calculated using the FEH Method. The greenfield rates are presented in Table 4 below and are included as Appendix F for reference.

Table 4. Equivalent greenfield runoff rates per hectare

Return Period (years)	Runoff Rate (l/s) Per ha
1 in 1	16.5
QBAR	14.52
1 in 30	29.36
1 in 100	40.58

Consideration of Drainage Hierarchy

9.4 TAN15 advises of the following hierarchy for the disposal of surface water;

1. Infiltration;
2. To a surface water body;
3. To a surface water sewer, highway drain or another drainage system; or
4. To a combined sewer.

9.5 The drainage hierarchy has been considered as follows:

Infiltration

9.6 Due to the ground conditions at the site, it is unlikely that soakaway drainage will be suitable for the long-term disposal of surface water. It is infiltration testing will be used to inform detailed drainage design and confirm the final drainage strategy.

To a Surface Water Body

9.7 Mapping indicates that the several ordinary watercourses are located within the site boundary. It is therefore deemed that this is the most suitable method of surface water disposal for the site.

To a Surface Water Sewer, Highway Drain or Another Drainage System

9.8 It is unsuitable to use a connection to the local sewer due to the nature of the site. Therefore, it is proposed to use a water body for the disposal of surface water.

To a Combined Sewer

9.9 It is unsuitable to use a connection to the local sewer due to the nature of the site. Therefore, it is proposed to use a water body for the disposal of surface water.

Proposed Surface Water Drainage

9.10 The difference between pre and post development rates is minimal as the proposed impermeable areas accounts for only 2% of the whole site and impermeable areas are dispersed across the wider site area. Each turbine location will introduce c.0.095ha of impermeable area, which would require c. 53m3 of storage for each turbine for the 1 in 100 + 30% climate change event. A level of permeability is assumed for the access track at the site. Drainage calculations are included as Appendix G.

9.11 Due to the topography, the site has been split into two catchments. It is anticipated that the existing site runoff patterns will be maintained, therefore minimising the potential effects upon current water supplies and hydrology in the area.

9.12 Filter drains will be placed downgradient of the turbines, which will intercept and attenuate runoff.

9.13 Filter strips will be placed adjacent to the access tracks at the site, which will intercept and attenuate runoff. Gravel infill will provide storage and treatment for surface water flows.

9.14 It should be noted that the Proposed Drainage Strategy indicated within Section 9 is preliminary, and as such, subject to further detailed design and approval by the relevant authorities. The proposed drainage would provide storage up to the 1 in 100-year plus 30% climate change storm event. In the event the attenuation measures reach capacity, excess water will overtop and be conveyed by gravity across the fields mimicking the existing site runoff characteristics. Wind farm components are not vulnerable in the event of exceedances.

Construction Stage Drainage

9.15 During construction of the development, the building contractor will be responsible for management and disposal of rainwater runoff generated from the site.

9.16 The contractor shall develop a formal site management plan, which will address pollution management and control in relation to site plant and vehicles, raw materials storage and waste generation, to ensure that all surface water runoff generated in the temporary condition will be free of contamination.

9.17 The contractor shall provide temporary drainage measures to contain runoff within the development site boundary ensuring that this is sized appropriately, and that means to remove excess surface water are available for use at all times. As previously mentioned, it is likely that similar methods will be used during the operational phase and it is recommended that the location of the required SuDS are agreed holistically, giving consideration to both the construction and operational phase, to reduce disruption within the site locality.

Site Specific SuDS Benefits

9.18 Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- storing run-off and releasing it slowly (attenuation);

- allowing water to soak into the ground (infiltration);
- slowly transporting (conveying) water on the surface;
- filtering out pollutants;
- allowing sediments to settle out by controlling the flow of water.

9.19 CIRIA has produced several guidance documents covering a range of water management scenarios. A summary of the publications used as reference when the site drainage strategy was produced are listed below.

- Planning for SUDS – making it happen (C687)
- Site handbook for the construction of SUDS (C698)
- The SUDS Manual 2015 (C753)
- Sustainable Drainage Systems – Hydraulic, structural and water quality advice (C609)
- Sustainable drainage systems - non-statutory technical standards.

Water Quality

9.20 Surface water run-off should be managed by SuDS that are designed to attenuate flows and to avoid water quality impacts downstream. To demonstrate that surface water arising from the development will be appropriately treated prior to discharge, the Simple Index Approach, as outlined within the SuDS Manual (CIRIA C753) has been followed.

9.21 As stated in the SuDS Manual 2015 (C753), the risk posed by surface water runoff to the receiving environment is a function of:

- the pollution hazard at a particular site (i.e. the *pollutant source*)
- the effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, groundwater (i.e. the *pollutant pathway*)
- the sensitivity of the receiving environment (i.e. the *environmental receptor*).

9.22 The development is classified as a site with low pollution, and in particular sites with low traffic roads (eg cul de sacs, home zones and general access roads), therefore the pollution hazard level is 'low.' The pollutant hazard indices for this type of development are outlined in The SuDS Manual (CIRIA C753) Table 26.2 and Table 8 below.

9.23 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

9.24 Table 5 provides the mitigation indices for the major SuDS components the site. This confirms that the total level of surface water treatment required by the simple index approach is exceeded based on SuDS Manual (CIRIA C753) Table 26.4.

Table 5. Mitigation Indices

	TSS	Metals	Hydrocarbons
Pollution hazard indices	0.5	0.4	0.4

Filter Drain	0.4	0.4	0.5
Filter Strip	(0.4*0.5) 0.2	(0.4*0.5) 0.2	(0.4*0.5) 0.2
Total Mitigation Score	**0.6**	**0.6**	**0.7**

Maintenance and Adoption

9.25 A specialist management company will be identified at the detailed design stage and appointed to maintain the SuDS features for the lifetime of the development.

9.26 Tables 6 and 7 below, indicate the envisaged maintenance activities associated with the proposed SuDS features and associated infrastructure, along with the approximate frequency within which they should be completed.

Table 6. Drainage Maintenance for Filter Strips

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Remove little and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (eg oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)

Occasional Maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 7. Drainage Maintenance for Filter Drains

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

10 OFFSITE IMPACTS AND RESIDUAL RISK

10.1 Incorporation of one or more runoff management techniques as outlined in Section 9 will have a positive impact upon field drainage and there will be limited impacts on off-site surface water receptors.

10.2 The Proposed Development would maintain the existing rates of runoff, not block any overland flow pathways, reduce the risk of nutrient or pesticide wash off on soil particulates thereby improving water quality in the receiving watercourse, and also contribute to maintenance of the natural drainage regime.

10.3 For extreme events, the site's topography will convey the majority of exceedance flows toward the existing ordinary watercourses at the site. This will be in line with current natural drainage patterns.

10.4 In summary, providing suitable soil management measures and monitoring of the site during operation, the Proposed Development would have negligible effect on flood risk on-site or elsewhere and would preserve the site's natural drainage regime.

11 FLOOD RISK VULNERABILITY CLASSIFICATION AND JUSTIFICATION TEST

11.1 In accordance with TAN 15, wind farm developments are classified as 'Less Vulnerable'.

Table 8. Flood Risk Vulnerability and Zone Compatibility

	Vulnerability Calassification		
Flood Zone	**Emergency Services**	**Highly Vulnerable**	**Less Vulnerable**
Zone A	Permitted	Permitted	Permitted
Zone B	If Site levels are greater then flood levels, no need to consider risk further	If Site levels are greater then flood levels, no need to consider risk further	If Site levels are greater then flood levels, no need to consider risk further
Zone C1	Yes – if justification test applied	Yes - if justification test applied	Yes - if justification test applied
Zone C2	Not permitted	Not permitted	Yes - if justification test applied

Justification Test

11.2 The site is classified as 'less vulnerable' and is considered to be suitable within Zone A. As such, development is not subject to the Justification Test.

12 SUMMARY AND CONCLUSIONS

12.1 A site-specific FCA following the guidance of the Planning Policy Wales and TAN 15 has been prepared for a wind farm development on land at Mynydd y Gaer Bridgend, CF35 6NH .

12.2 The site is located within DAM Zone A and is located within Flood Zone 1.

12.3 Mapping indicates that there is some flood risk from surface water flooding and small watercourses at the site. This is not within the locations of proposed turbines, but some portions of the access track fall within these extents. The flood extents are likely to be associated with the ordinary watercourses located across the site. In some areas the watercourses are proposed to be crossed, the potential flood risk will be considered when designing the crossings. An ordinary watercourse consent will also be required for the proposed watercourse crossings.

12.4 The development is classified within TAN 15 as ‘less vulnerable’ development and is considered to be suitable at this location.

APPENDICES

Appendix A

NRW Consultation Response

Grady, Jessica

From: Jessica.Grady@rps.tetratech.com
Subject: Flood/ Drainage Information Request: Mynydd y Gaer Wind Farm, Bridgend, CF35 6NH NRW:00693965

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: RE: Flood/ Drainage Information Request: Mynydd y Gaer Wind Farm, Bridgend, CF35 6NH NRW:00693965

Dear Jessica,

Thank you for your email which has been passed to our data team.

Concerning drainage, please see SUDS on our website – Natural Resources Wales / Sustainable Drainage Systems (SuDS)

For any pre-planning advice, please contact the relevant planning team – Natural Resources Wales / Contact us about a planning enquiry

For flood maps, please see this link – Data catalogue | DataMapWales

For historical flooding, please see this link – Recorded Flood Extents | DataMapWales

For groundwater, unfortunately we don't hold records on instances of groundwater flooding Please contact the relevant Council as they are the Lead Local Flood Authority on mitigating risk from groundwater flooding in its area. Please therefore contact them for further information on this.

For all flood data, please see this link – Data catalogue | DataMapWales

If you require further data, please contact us directly.

I trust this is of use.

Yn gywir/ Yours sincerely
Enw / **Name Michelle Lewis**
Teitl swydd / Job title Data Licensing Officer
Adran / Department Customer, Communications and Commercial
Rhif ffôn / Phone number 07917243096
Dyddiau gweithio (os yn berthnasol) / Working days Mon-Fri
Yn Ardystiedig o ran Llythrennedd Carbon/Certified Carbon Literate

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.
Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

Appendix B

BCBC Consultation Response

Grady, Jessica

From: Jessica.Grady@rps.tetratech.com
Subject: Flood/ Drainage Information Request: Mynydd y Gaer Wind Farm, Bridgend, CF35 6NH

From: landdrainage <landdrainage@bridgend.gov.uk>
Subject: RE: Flood/ Drainage Information Request: Mynydd y Gaer Wind Farm, Bridgend, CF35 6NH

Thank you for your email regarding drainage and flood risk, please see response below:

Drainage

Discharge rates would be limited to greenfield run-off including a 30% allowance for climate change.
Flood defence consents will be required for any discharge to watercourse, culverting of watercourses will also require flood defence consent but will only be permitted for short lengths for access purposes.
A SAB application will be required where the cumulative hard surface exceeds 100m2
The Surface Water Drainage Assessment should include drainage routes, disposal methods, discharge points, including temporary works during construction, etc this would form part of the SAB application

Flood Risk

The current Flood Mapping is available on the NRW website.
There are no recorded flood events which impact the site
We have no records of groundwater flooding
The nearby areas are crossed by multiple small ditches and watercourses, the area is noted as being historically "wet ground", during prolonged periods of wet weather the ground becomes saturated which affects infiltration and run-off can adversely affect properties downstream.

Best regards

Stephen Edwards
Swyddog Draenio | Land Drainage Officer
Y Gyfarwyddiaeth Cymunedau | Communities Directorate
Cyngor Bwrdeistref Sirol Pen-y-bont ar Ogwr | Bridgend County Borough Council

Ffôn / Phone: (01656) 642576
E-bost / Email: stephen.edwards@bridgend.gov.uk
Gwefan / Website: www.bridgend.gov.uk

Appendix C

Site Visit Technical Note (HLEF83507 - Mynydd y Gaer Wind Farm Technical Note R v1 20220915)

4th Floor,
1 Newhall St,
Birmingham, B3 3NH

Our ref: HLEF83507 – Mynydd y Gaer Wind Farm

Date: 15 September 2022

Mynydd y Gaer Wind Farm
Client: Cenin

TECHNICAL NOTE

Mynydd y Gaer Wind Farm, Bridgend, CF35 6NH

1 INTRODUCTION

1.1 Terms of reference

1.1.1 RPS has been commissioned to undertake an initial hydrological appraisal of the application area, and site visit in order to gain an understanding of the site setting and hydrological characteristics. The information obtained will be utilised to inform a Flood Consequence Assessment (FCA) and SuDS Strategy in support an application for c. 13no. wind turbines on land at Bridgend CF35 6NH.

1.1.2 This Technical Note presents the findings of both the desktop hydrological study, as well as the information recorded during the site visit.

2 SITE DETAILS

2.1 Site Location

2.1.1 The Assessment Area occupies approximately 300 hectares (ha) and is centred around National Grid Reference SS953862. The Assessment Area location and proposed turbine locations (numbered for ease of identifying) are presented in Figure 1.

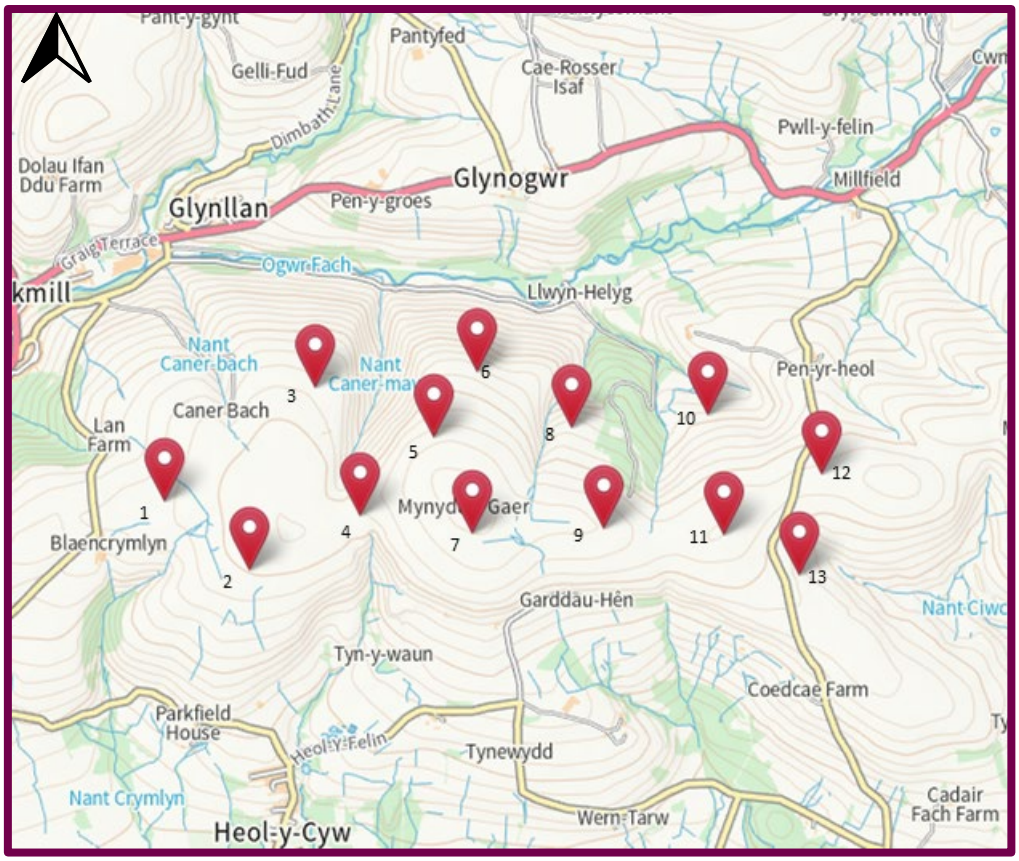


Figure 1. Site Location Approximate turbine locations indicated in red for location purposes only.

2.1.2 The site is currently occupied by agricultural land.

2.2 Proposed Development

2.2.1 The proposed development includes the construction of c. 13no. wind turbines. Development plans indicating the proposed turbine locations are shown in Appendix A.

2.2.2 The Technical Advice Note 15 (TAN 15) classifies the proposed use as 'Less vulnerable development' with regard to flood risk.

3 HYDROLOGICAL SETTINGS

3.1 Nearby Watercourses

3.1.1 OS mapping indicates that there are several ordinary watercourses in the vicinity of the proposed turbine locations including the Nant Caner-Mawr, Nant Caner-Bach and Nant Cwm-Dwr.

3.1.2 A reach of the Ogwr Fach is located to the north of the Assessment Area.

3.2 Existing Flood Data and Flood Risk Considerations

3.2.1 The Natural Resources Wales (NRW) flood risk map, indicates that the Assessment Area is located outside of the area where the annual probability of river or coastal water flooding is 0.1%. The mapping indicates that risk from surface water is present within the Assessment Area, however this appears to be associated with watercourses in the vicinity of the Assessment Area and does not encroach upon the proposed locations of the turbines.

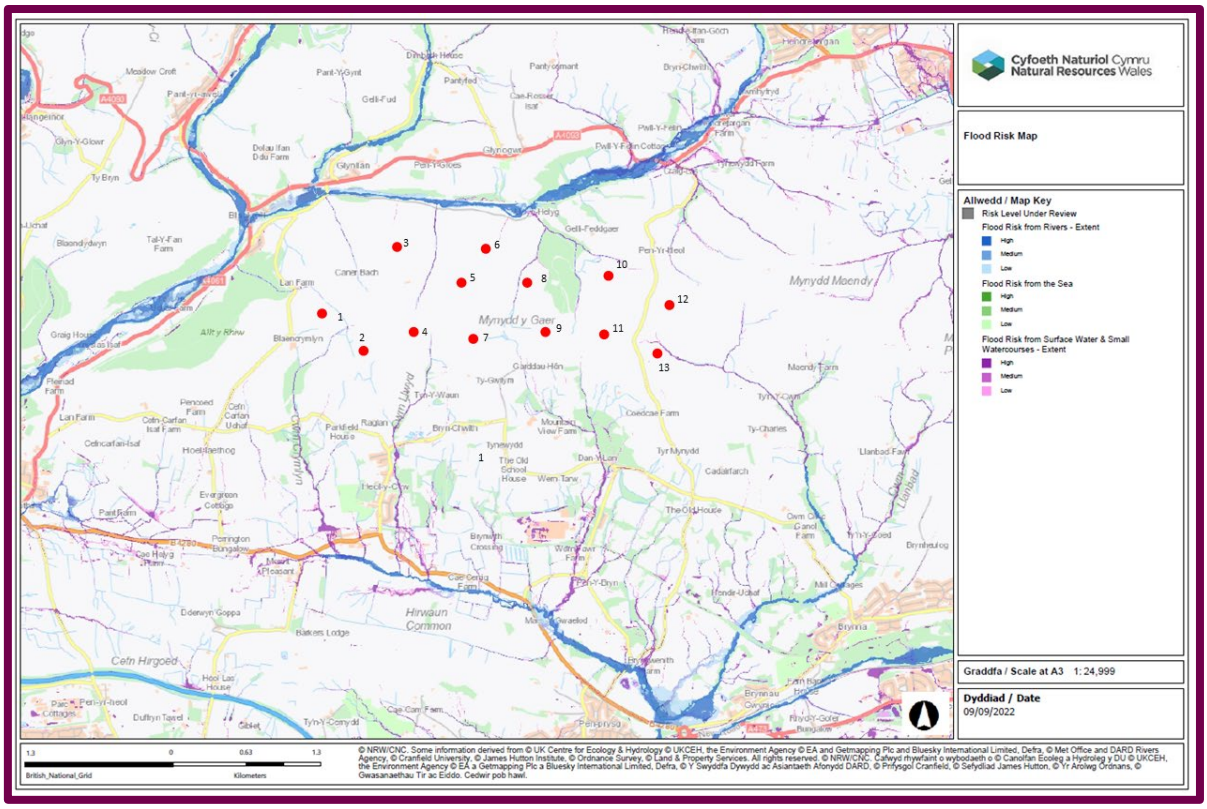


Figure 2. NRW Flood Risk Map Approximate turbine locations indicated in red for location purposes only.

4 SITE VISIT OBSERVATIONS

4.1.1 A site visit was undertaken on 23rd August 2022 to assess the proposed locations of the turbines and observe any additional flood risk issues.

4.1.2 The proposed locations of turbines 3, 5, 6 and 13 were not observed during the site visit due to access constraints.

4.1.3 Images are provided below showing the proposed locations of several turbines which were observed during the site visit.

Figure 3: Proposed location of Turbine 1 (facing north west)

Figure 4: Proposed location of Turbine 2 (facing south)

Figure 5: Proposed location of Turbine 4 (facing west)

Figure 6: Proposed location of Turbine 7 (facing south east)

Figure 7: Proposed location of Turbine 8 (facing north west)

Figure 8: Proposed location of Turbine 9 (facing west)

Figure 9: Proposed location of Turbine 10 (facing south west)

Figure 10: Proposed location of Turbine 11 (facing east)

Figure 11: Proposed location of Turbine 12 (facing east)

Figure 12: View of valley within vicinity of proposed locations for Turbines 3 and 4 (facing north)

Figure 13: Watercourse located at the base of valley in vicinity to proposed locations for Turbines 3 and 4 (facing south)

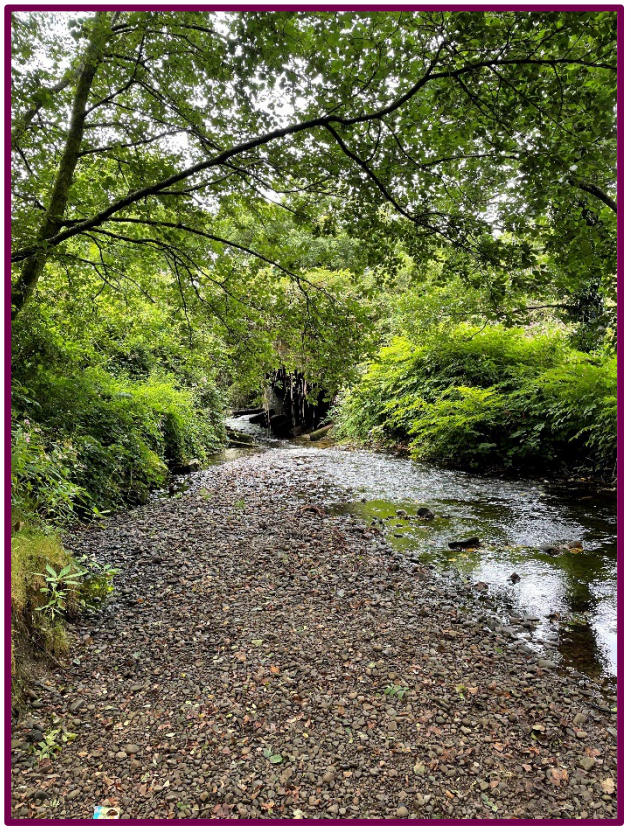


Figure 14: View of Ogwr Fach (facing west)

Figure 15: Watercourse adjacent to woodland within the north east portion of proposed site

Figure 16: Watercourse piped under track located to the east of the proposed site

5 SUMMARY AND CONCLUSIONS

5.1.1 Based upon data available from NRW and observations made during the site visit, it is deemed that from a flood risk perspective, the current proposed locations for the wind turbines are at low risk of flooding. Consideration on the location of access tracks and watercourse crossing should be undertaken at design stage to ensure potential impacts can be readily mitigated.

Yours sincerely,
for RPS Consulting Services Ltd

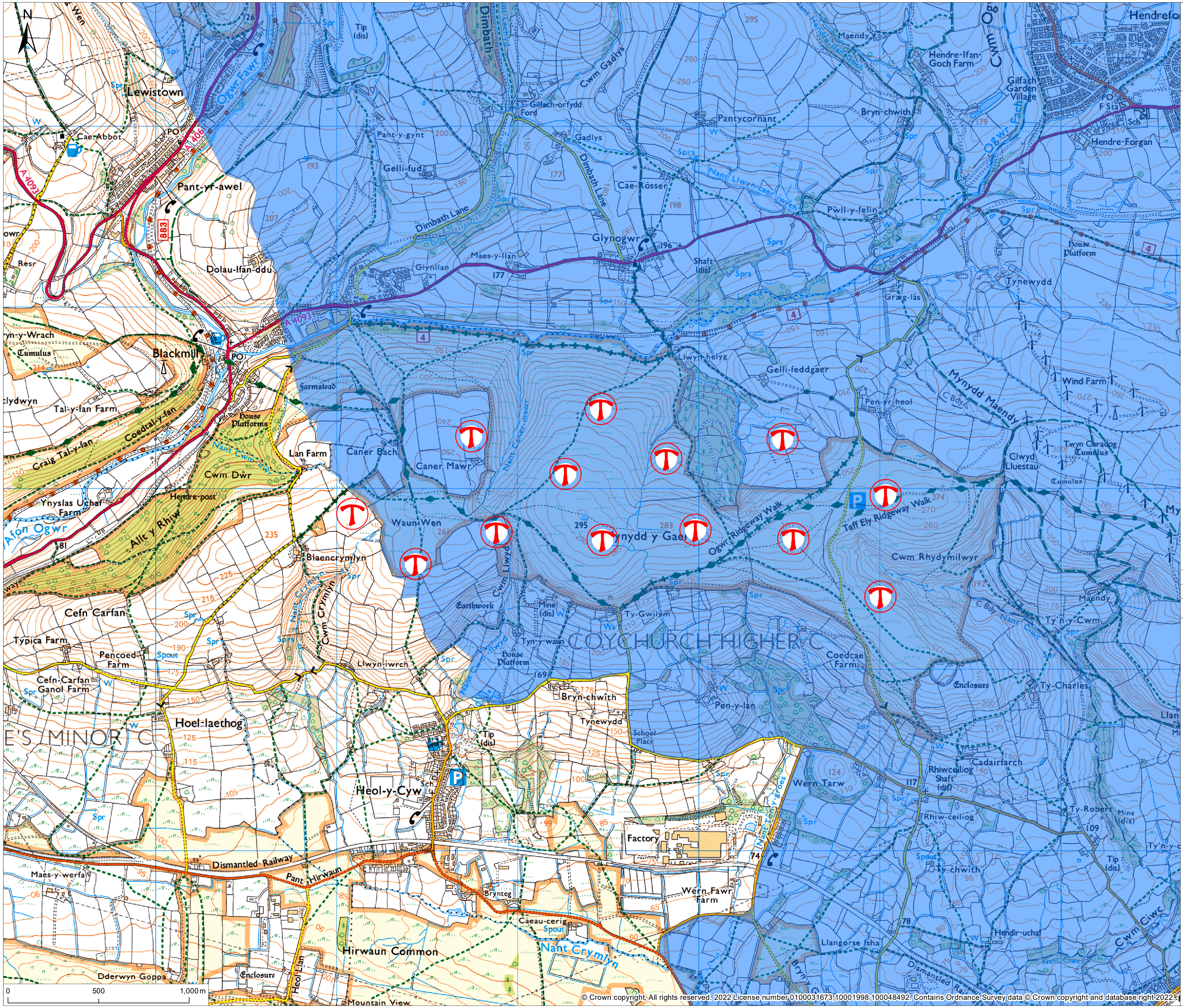
Josh Hughes
Consultant - Hydrology
josh.hughes@rpsgroup.com
+44 1902 925 491

APPENDICES

Appendix A Development Plans

Appendix A

Development Plans



O:\04 JOBS\01 OPEN JOBS\JPW18xx\JPW1807 - Wind Farm at Mynydd y Gaer (DW)\4. Drawings\1. RPS Drawings\MXD\JPW1807-001RevB_D220208_(Mynydd y Gaer Proposed Turbine Locations).mxd

Notes
1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.

Legend

- Mynydd y Gaer Proposed Turbine Locations
- NDF Preassessed Areas for Wind Energy

Rev	Description	By	CB	Date
B	Turbine location amendments	GG	DP	08/02/22
A	Added the NDF Wind Areas to plan	GG	DP	21/01/22

MAKING COMPLEX EASY

2 Callagham Square, Cardiff, CF10 5AZ
T: +44(0)2920 668 662 E: rpsca@rpsgroup.com

Client CENIN

Project MYNYDD Y GAER

Title PROPOSED TURBINE LOCATIONS

Status	Drawn By	PM/Checked By
DRAFT	GG	DW
Project Number	Scale @ A3	Date Created
JPW1807	1:20,000	FEB 2022

Drawing Number: **JPW1807-001** Rev: **B**

rpsgroup.com

Appendix D

Development Plans

Proposed Mynydd y Gaer Wind Farm

Site Layout Plan

December 18th 2024
Scale 1:12,500 @ A3
Drwg: MyG4-11b

- Red line
- Turbine locations
- Permanent electrical infrastructure
- Access tracks 5m
- Grid cable routes
- Grid connection corridor
- Woodland Enhancement
- Permanent hardstandings
- Temporary hardstandings
- Temporary construction areas and holding bays
- Borrow pits
- Existing Ridgeway Walk
- Existing public footpaths
- Existing byway open to all traffic (BOAT). Proposed to be downgraded to a restricted byway
- Existing bridleways
- Existing parking to be expanded, improved and maintained
- Grasscrete extension for recreational use for users of the common

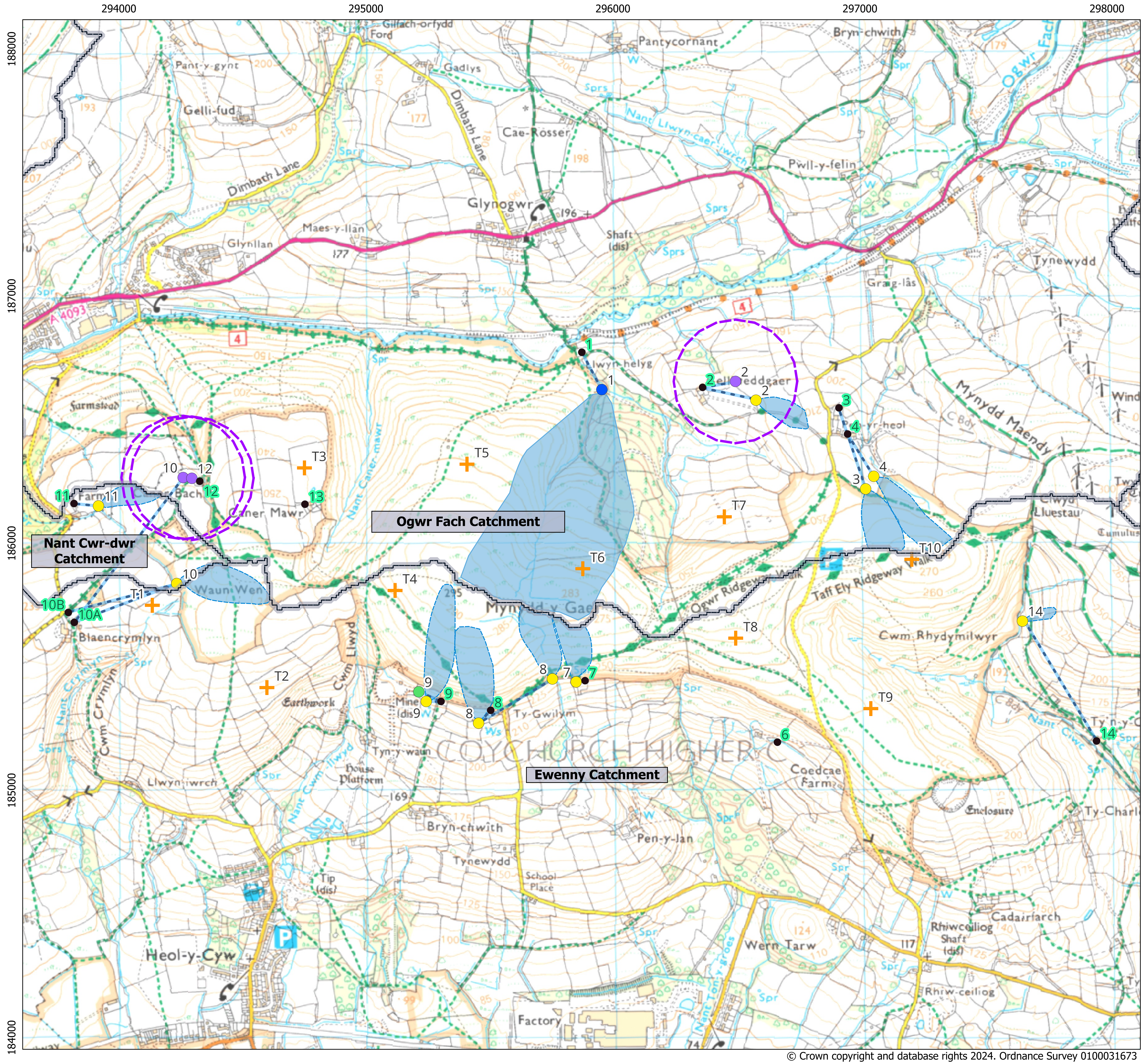
CENIN

Authored by RAH. *Hamon Wind and Solar Design.*

0.25 0.13 0 0.25 0.5 0.75 1 Kilometers

Appendix E

Private Water Supply Assessment Map



Key:

- House Locations
- Turbine Location
- PWS Pipe Line
- 250 m Borehole Buffer Zone
- River Catchment Boundary

Catchments

- Spring
- Stream

Private Water Supply Source

- Borehole
- Pond
- Spring
- Surface water

0 500 1,000 m

PROJECT

Mynydd y Gaer Wind Farm

SCALE

1: 20,000 @ A3

FIGURE 1

Private Water Supply Assessment

FLUID ENVIRONMENTAL CONSULTING

Drawn by: BE Date: 14/06//2024

Appendix F

Greenfield Runoff Rate

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Jessica Grady
Site name:	Mynydd y Gaer
Site location:	Bridgend

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.56411° N
Longitude:	3.51069° W
Reference:	1419498476
Date:	Jan 09 2025 16:24

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 1

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.399
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.08

Hydrological characteristics

	Default	Edited
SAAR (mm):	1641	1439
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):		16.5
1 in 1 year (l/s):		14.52
1 in 30 years (l/s):		29.36
1 in 100 year (l/s):		35.96
1 in 200 years (l/s):		40.58

Appendix G

Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	Preferred Cover Depth (m)	1.000
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1 - Storage	0.094	5.00	100.000	1500	1010.000	1000.000	1.000
2 - Flow Control			100.000	2100	1020.000	1000.000	1.100
3 - Overflow			100.000	1500	1030.000	1000.000	1.200

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Volume	✓
Summer CV	1.000	Drain Down Time (mins)	2880	100 year 360 minute (m³)	
Winter CV	1.000	Additional Storage (m³/ha)	0.0		
Analysis Speed	Normal	Check Discharge Rate(s)	x		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	30	0	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 2 - Flow Control Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	99.350	Product Number	CTL-SHE-0061-1400-0650-1400
Design Depth (m)	0.650	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.4	Min Node Diameter (mm)	1200

Node 1 - Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	750.0	0.0	0.600	750.0	0.0

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 98.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1 - Storage	236	99.472	0.472	12.4	52.7861	0.0000	OK
240 minute winter	2 - Flow Control	232	99.474	0.574	3.3	1.9875	0.0000	OK
15 minute summer	3 - Overflow	1	98.800	0.000	1.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	1 - Storage	1.001	2 - Flow Control	3.3	0.325	0.005	2.5775	
240 minute winter	2 - Flow Control	Hydro-Brake®	3 - Overflow	1.4				67.0

Appendix H

Conceptual Surface Water Drainage Layout

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

PRELIMINARY
SUBJECT TO DETAILED DESIGN

This drawing illustrates a sketch proposal only and as such is subject to detailed site investigation including ground conditions/contaminants, drainage, design and planning/density negotiations. The layout maybe based upon an enlargement of an OS sheet or other small scale plans and its accuracy will need to be verified by Survey. Full risk analysis under the CDM Regulations has not been undertaken.

KEY

- Filter Strips
- Existing Mapped Watercourses
- Catchment Boundary
- Filter Drain

Total Site Area - c.319ha

The site currently falls into two catchments. It is proposed to maintain the existing runoff patterns where possible, as per the site topography.

Turbine locations will introduce c.0.095ha impermeable area, requiring 53m^3 storage for the 1 in 100 + 30%cc event

Filter drains to be located downgradient of the turbine locations to capture and attenuate surface water

Filter strips to be located adjacent to access tracks, to capture surface water runoff. Filter strips will contain gravel fill to provide storage and treatment benefits

Each turbine location has an impermeable area of c.0.095ha

Requires c.53m^3 storage for the 1 in 100 + 30%cc event

Filter drains located at the downgradient of each turbine location to capture and store runoff

Catchment A

Catchment B

Filter strips positioned along access track to capture runoff and direct in line with existing flow patterns at site

Rev	Description	By	Ckd	Date
A	Conceptual Drainage Plan	JG	JM	08.01.25

A TETRA TECH COMPANY
4th Floor, 1 Newhall Street, Birmingham,
West Midlands B3 3NH
T: +44 121 622 8520 E: rpshydrologyservices@rpsgroup.com

Client: Cenin Renewables

Project: Mynydd y Gaer Wind Farm

Title: Conceptual Drainage Plan

Status	Scale	Date Created
Preliminary	@A0	08.01.2025

Task Team Manager	Information Author	Task Information Manager
JM	JG	JM

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