



Mynydd y Glyn Wind Farm

Draft Environmental Statement

Appendix 10A Draft Flood Consequence Assessment



This report was prepared by WSP Environment & Infrastructure Solutions UK Limited (formerly known as Wood Environment & Infrastructure Solutions UK Limited), company registration number 02190074, which is carrying out these services as a subcontractor and/or agent to Wood Group UK Limited

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Document revisions

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| 1 | Draft FCA for client comment | 12/10/22 |
| 2 | Final Report | October 2022 |

Executive summary

- 1.1.1 This Draft Flood Consequence Assessment (FCA) accompanies the Draft Environmental Statement (ES) for the proposed Mynydd y Glyn Wind Farm (the 'Proposed Development') located near approximately 600m from the south-eastern edge of the village of Pant (National Grid Reference: ST 03626 89459).
- 1.1.2 The Draft FCA has been prepared in line with Welsh planning policy (principally the Welsh Government's (WG) TAN15) and associated guidance to a) assess the consequences of flooding from all sources both during the construction and operational phases of development; and b) to appraise the potential effects of the scheme on the baseline level of existing flood risk to third parties to identify any significant consequences. The Proposed Development comprises the Wind Farm development (inclusive of internal access tracks, substation, underground cables and Temporary Construction Compound (TCC)) and the Grid Connection (which comprises an overhead line (OHL) and underground cable). Once constructed, the significant permanent above ground infrastructure would be a maximum of seven wind turbines, a substation and wooden pole OHLs. All temporary construction works associated with the Proposed Development would be removed with the ground being reinstated to a similar condition and elevation as at present.
- 1.1.3 The hydrological baseline has been determined with information from desktop sources (Wind Farm development and Grid Connection (OHL and underground cable) and a walkover survey (Wind Farm development and OHL section of the Grid Connection). The Proposed Development intersects the headwaters of several small ordinary watercourses. Potential mitigation to assist in conveying flows (consistent with the existing flow pathways) is proposed including pipe culverts beneath the access tracks. All potential sources of flooding have been considered under this assessment, which has identified that surface water runoff originating from the Proposed Development poses the greatest potential flood risk.
- 1.1.4 Suitable flood risk management measures have been identified to address the potential risks identified; these include a Water Management Plan for the construction phase, stand-off distances from watercourses, stockpile management and a Detailed Drainage Design for the operational phase. Risks during decommissioning are considered to be very similar to those for construction, albeit disturbance will be more limited as some below-ground infrastructure will be left in-situ. Appropriate permissions and supporting appraisals will be obtained at the time of decommissioning to comply with the then current legislation and guidance. No residual risks were identified following this FCA, as such no additional mitigation measures are required. For the Draft FCA, an outline approach to drainage has been identified, including identification of the discharge locations (discharge to ground and if required supplemented by discharge to watercourses), discharge rates (greenfield QBAR) and Sustainable Drainage Systems (SuDS) attenuation volumes (up to and including the 1% AEP plus 20% and 40% climate change events for the construction and operational phases respectively). Investigation of the viability of infiltration as a means by which surface water runoff could be discharged will be undertaken post- ES, through liaison with Rhondda Cynon Taf County Borough Council (RCTCBC) as the SuDS Approval Body (SAB) and by undertaking soakaway testing. In the case that the soakaway testing concludes that infiltration is not solely sufficient in managing runoff, and discharge to the watercourses is required, this will be subject to a Consent from Natural Resources Wales (NRW) and RCTCBC. Consultation with BGCBC, as the SAB, to discuss the proposed drainage strategy will be undertaken and any comments will be incorporated in the final ES submission.

- 1.1.5 Implementation of the identified flood risk management measures is considered to be appropriate mitigation to ensure the Proposed Development will be safe from flooding for its lifetime, with consideration of the vulnerability of its users, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall. The majority of the Proposed Development lies within a very low flood risk area (Flood Zone A). However, as the WPD electrical connection point lies within Flood Zones B and C1 associated with Afon Taf, the underground cable needs to cross a small area (about 300 m) of floodplain, and as a result is subject to the Justification Test. A review of potential areas for the Proposed Development was undertaken during the design evolution process, taking into account technical factors, including wind resource, electronic infrastructure, land value, land form, land cover and high level desk-based assessment of environmental impacts (**Chapter 3: Need, Alternatives and Iterative Design**). The Proposed Development site was considered to offer a good combination of all assessment factors. The Justification Test is therefore considered to be passed.
- 1.1.6 The Draft FCA concludes that the Proposed Development, together with the proposed flood risk management measures above, will not be subject to an unacceptable level of risk, nor would there be potential increased flood risk elsewhere. As such the Proposed Development is acceptable on flood risk grounds and meets the aims of TAN-15.

Contents

| | | |
|-----------|--|-----------|
| 1. | Introduction | 7 |
| 1.1 | Purpose of this Report | 7 |
| 1.2 | Sources of Data and Information | 7 |
| | Terminology | 8 |
| 1.3 | Structure of this report | 9 |
| 2. | Site Description, Development Proposal and Planning Context | 10 |
| 2.1 | Introduction | 10 |
| 2.2 | Site Description | 10 |
| | The Site | 10 |
| | Land use and topography | 10 |
| | Hydrology and Drainage | 11 |
| | Geology, Hydrogeology and Soils | 12 |
| 2.3 | Development Proposals | 14 |
| 2.4 | Planning Context | 15 |
| | Introduction | 15 |
| | National Policies | 15 |
| | Local plans and policies | 16 |
| 2.5 | The Justification Test | 17 |
| 3. | Flood Risk Appraisal | 19 |
| 3.1 | Introduction | 19 |
| 3.2 | Screening of all Potential Sources of Flood Risk | 19 |
| 3.3 | Historical Flooding | 20 |
| 3.4 | Fluvial Flooding | 20 |
| | Wind Farm development | 20 |
| | Grid Connection | 20 |
| 3.5 | Surface water flooding | 21 |
| | Surface water run-on | 21 |
| | Surface water runoff | 22 |
| 3.6 | Groundwater Flooding | 23 |
| 3.7 | Artificial Flooding | 24 |
| | Wind Farm development | 24 |
| | Grid Connection | 24 |
| 4. | Outline Drainage Strategy | 25 |
| 4.1 | Introduction | 25 |
| 4.2 | Overview of Drainage Strategy Scope | 25 |
| 4.3 | SuDS – Legislation and Guidance | 26 |
| | Technical Advice Note 15 (TAN15) | 26 |

| | | |
|-----------|--|-----------|
| | Floods and Water Management Act, 2010 | 26 |
| | Sustainable Drainage (SuDS) Statutory Guidance, Welsh Government | 26 |
| | CIRIA SuDS Manual (C753) | 26 |
| | DEFRA Non-statutory technical standards for sustainable drainage systems, 2015 | 26 |
| | LLFA and SAB Advice | 27 |
| | Compatibility of SuDS with Site conditions | 27 |
| 4.4 | Proposed Outline Drainage Strategy for Wind Farm Development | 27 |
| | Surface Water Discharge Hierarchy | 27 |
| | Greenfield Runoff Rates | 28 |
| | The proposed SuDS solution | 29 |
| 4.5 | Proposed Outline Drainage Strategy for Grid Connection | 30 |
| 4.6 | SuDS maintenance | 31 |
| 5. | Flood Risk Mitigation | 32 |
| | Construction and operational phases | 32 |
| | Decommissioning phase | 35 |
| 6. | Conclusions | 36 |

| | | |
|-----------|--|----|
| Table 1.1 | Sources of desktop information used in this assessment | 7 |
| Table 1.2 | Flood Zone definitions and associated annual exceedance probability | 8 |
| Table 2.1 | Local Plans, policies and guidance | 16 |
| Table 2.2 | Application of the TAN15 policy requirements | 17 |
| Table 3.1 | Screening of all Potential Sources of Flood Risk | 19 |
| Table 3.2 | Screening of all Potential Sources of Flood Risk | 22 |
| Table 4.1 | Existing Greenfield Runoff Rates | 29 |
| Table 4.2 | Indicative proposed SuDS Solution for Wind Farm development | 29 |
| Table 5.1 | Proposed flood risk management measures for the Proposed Development | 32 |

| | | |
|---------------|--|---------------|
| Figure 10A.1a | Wind farm development – site layout | After Page 18 |
| Figure 10A.1b | Proposed development elements | After Page 18 |
| Figure 10A.2 | Water features | After Page 18 |
| Figure 10A.3 | NRW Flood Map for Planning | After Page 18 |
| Figure 10A.4 | Development Advice Map (Flood Zones B, C1 and C2) | After Page 18 |
| Figure 10A.5 | Flood Risk Assessment Wales map – Flood Risk from surface water and small watercourses | After Page 24 |
| Figure 10A.6 | Flood Risk Assessment Wales map – Flood Risk from reservoirs | After Page 24 |
| Figure 10A.7 | Flood Risk Receptors | After Page 24 |

Annex A Correspondence and data provided by RCTCBC
Annex B Correspondence and data provided by NRW
Annex C Estimation of Surface water Runoff Attenuation Volumes

1. Introduction

1.1 Purpose of this Report

1.1.1 This Draft Flood Consequence Assessment (FCA) accompanies the Draft Environmental Statement (ES) for the proposed Mynydd y Glyn Wind Farm (the ‘Proposed Development’) located near Pontypridd. This Draft FCA has been prepared in accordance with Technical Advice Note 15: Development and Flood Risk (TAN15)¹ and demonstrates how flood risk to the Proposed Development and any increased flood risk to third parties due to that development, would be managed over the lifetime of the development, taking climate change into account.

1.2 Sources of Data and Information

1.2.1 **Table 1.1** summarises sources of data, site plans and maps that have been used to inform this assessment. Data requests have also been undertaken with Rhondda Cynon Taf County Borough Council (RCTCBC), as the Lead Local Flood Authority (LLFA) and SuDS Approval Body (SAB), and Natural Resources Wales (NRW). Copies of relevant correspondence are provided in **Annex A** and **Annex B** of this report respectively.

Table 1.1 Sources of desktop information used in this assessment

| Source | Data |
|---|---|
| Local Ordnance Survey (OS) | Topography and location of springs |
| BGS Geindex Onshore | Aquifer Designation (available online http://mapapps2.bgs.ac.uk/geindex/home.html ; accessed August 2022) |
| Rhondda Cynon Taf County Borough Council (2013) | Local Flood Risk Management Strategy (available online: Local Flood Risk Management Strategy ² ; accessed August 2022) |
| British Geological Survey (BGS) | BGS Geology Viewer (available online: BGS Geology Viewer - British Geological Survey ³ accessed August 2022) |
| Cranfield University | LandIS soilscales viewer for soil classification (available online http://www.landis.org.uk/soilscales/ ; accessed August 2022) |
| Natural Resources Wales | Natural Resources Wales Flood Risk Map Viewer (available online: Natural Resources Wales / Check your flood risk on a map (Flood Risk Assessment Wales Map) ⁴ accessed August 2022); |

¹ The current version of TAN15 dates from 2004. At the time of writing (August 2022), an updated TAN15 has been prepared, but is not expected to be adopted until June 2023. [Online] Available at: <https://gov.wales/technical-advice-note-tan-15-development-flooding-and-coastal-erosion#description-block> [Accessed 11 August 2022]

² Rhondda Cynon Taf County Borough Council (2013). Local Flood Risk Management Strategy. [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/localfloodriskmanagementstrategyv1.pdf> [Accessed 11 August 2022]

³ British Geological Society. (2022). BGS Geology Viewer. [Online] Available at: <https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/> [Accessed 11 August 2022]

⁴ Natural Resources Wales Flood Risk Map Viewer. [Online] Available at: <https://naturalresources.wales/flooding/check-your-flood-risk-on-a-map-flood-risk-assessment-wales-map/?lang=en> [Accessed 11 August 2022]

Terminology

- 1.2.2 In this report, the probability of a flood occurring is expressed in terms of Annual Exceedance Probability (AEP), which is the reciprocal of the annual maximum return period. For example, the 100-year flood can be expressed as the 1% AEP flood, i.e., a flood that has a 1% chance of being exceeded in any year.
- 1.2.3 **Table 1.2** is provided to clarify the use of the AEP terminology as well as a description of the flood band definitions as used by the NRW in the Flood Map for Planning (FMfP), and the Welsh Flood Zones set out in the Welsh Government's TAN15 Development Advice Map (DAM) and associated guidance.

Table 1.2 Flood Zone definitions and associated annual exceedance probability

| WG TAN15 DAM Flood Zone | NRW Flood Zones | Probability of flooding | AEP | Definition |
|---|-----------------|-------------------------------------|--|--|
| Flood risk from rivers and the sea | | | | |
| Flood Zone A | Flood Zone 1 | Low Probability | <0.1% AEP of river or sea flooding | Land with less than 1 in 1,000 probability of flooding from rivers or the sea, in any given year |
| Flood Zone C1 (developed and served by significant flood defences) / Flood Zone C2 (no significant flood defences) | Flood Zone 2 | Medium Probability | 1% - 0.1% AEP of river flooding 0.5% – 0.1% AEP of sea flooding | Land with between a 1 in 100 and 1 in 1,000 of river flooding; or land having between a 1 in 200 and 1 in 1,000 probability of sea flooding |
| Flood Zone B | N/A | N/A | N/A | Geological indicators of flooding |
| N/A | Flood Zone 3 | High Probability | >1% AEP of river flooding >0.5% AEP of sea flooding | Land having a 1 in 100 or greater probability of river flooding in any year; or Land having a 1 in 200 probability or greater of sea flooding in any year. |
| Flood risk from surface water and small watercourses | | | | |
| N/A | Very low risk | Less than 0.1% AEP of flooding | | Land with less than 1 in 1,000 probability of surface water flooding in any year. |
| N/A | Low risk | Between 1% and 0.1% AEP of flooding | | Land with between a 1 in 100 and 1 in 1,000 probability of surface water flooding in any year. |
| N/A | Medium risk | Between 3.3% and 1% AEP of flooding | | Land having a probability of river flooding of between 1 in 30 and 1 in 100 in any year; |
| N/A | High risk | >3.3% AEP of flooding | | Land having a 1 in 30 or greater probability of surface water flooding in any year. |

| WG TAN15 DAM Flood Zone | NRW Flood Zones | Probability of flooding | AEP | Definition |
|-------------------------------|-----------------|-------------------------|-----|--|
| Groundwater flood risk | | | | |
| N/A | N/A | N/A | | Flood risk bands assessed by professional judgement, in the absence of criteria set by NRW. |
| Sewer flood risk | | | | |
| N/A | N/A | N/A | | Flood risk bands assessed by professional judgement, in the absence of criteria set by NRW. |
| Artificial flood risk | | | | |
| N/A | N/A | N/A | | Flood risk assessed on the basis of flood extent shown on NRW Flood Risk from Reservoir Map. |

Notes: * Welsh Government's (WAG) Technical Advice Note 15 (TAN15) Development Advice Map (DAM)

1.3 Structure of this report

1.3.1 The report is structured as follows:

- **Section 2** – Site Description: development proposals and planning context;
- **Section 3** - Flood Risk Appraisal;
- **Section 4** - Outline drainage strategy;
- **Section 5** - Flood Risk Mitigation; and
- **Section 6** - Conclusions and Recommendations.

1.3.2 Figures are presented within each section while supporting documents are presented at the end of the report in the form of appendices. These are as follows:

- **Annex A** contains details of the correspondence and data provided by RCTCBC;
- **Annex B** contains details of the correspondence and data provided by NRW; and
- **Annex C** contains a technical note with an estimation of surface water runoff attenuation volumes.

2. Site Description, Development Proposal and Planning Context

2.1 Introduction

- 2.1.1 This section provides an overview of the Proposed Development area location and characteristics (**Section 2.2**), a description of the Proposed Development (**Section 2.3**) and establishes the planning policy context for the Draft FCA (**Section 2.4**).

2.2 Site Description

The Site

- 2.2.1 The Proposed Development Site lies within the RCTCBC administrative area and its boundary is located approximately 600 metres (m) from the south-eastern edge of the town of Porth (National Grid Reference ST 03626 89459).
- 2.2.2 The current baseline is described separately for the Wind Farm development (wind turbines and crane pads, access tracks, temporary construction compounds (TCCs) and substation within red line boundary), and the Grid Connection Corridor (overhead line (OHL), which lies within the red line boundary, and underground cable, which lies outside the red line boundary) which are collectively referred to as the Proposed Development (**Figure 10A.1**). A walkover survey of the Wind Farm development area was carried out on 24 August 2022. Photographs of the walkover are provided in **Appendix 10C of Chapter 10: Water Environment**.

Land use and topography

Wind Farm development

- 2.2.3 The Wind Farm development is located on the summit (peaks at 377 m AOD) and upper slopes of the steep-sided hill of Mynydd-y-Glyn. The highest elevations are located on the northern half and towards the centre of the Proposed Development Site with ground levels falling in all directions but more steeply on the western edge. The Proposed Development Site boundary roughly flanks the 300 m AOD elevation contour. The Afon Rhondda Fawr valley is to the north, Nant Muchudd valley is to the southwest, and Nant Gelliwion valley is to the southeast of the Wind Farm development site.
- 2.2.4 Land use within the Wind Farm development almost entirely consists of improved and semi-improved grazing. There is a single plantation of deciduous woodland located towards the southern boundary. There is no other tree cover within the site except a few stream-side trees in the southeast and scattered patches of scrub in the northeast. There is no built development within the Site, but it is traversed by an overhead electricity transmission line supported by double pole pylons. The closest built development is located to the southeast, at Langton Court Farm, and to the east at Rhiw-garn-fach and Rhiw-garn-fawr. The closest towns/villages include Porth approximately 0.6 km northwest, Tonyrefail approximately 0.9 km southwest and Pontypridd approximately 2 km east of the Wind Farm development site. The A4058 and A4233 roads are located to the

north and west, respectively, of the Wind Farm development site connecting Porth with Pontypridd and Tonyrefail (**Figure 10A.1**).

Grid Connection

- 2.2.5 The Grid Connection corridor is located on the south-eastern face of the Mynydd y Glyn, with the overhead line (OHL) route extending to approximately NGR ST 04359 88432 south of Cefn-Coed farm and the underground cable route extending to the western bank of Afon Taf near Upper Boat. Ground levels (from west to east) drop from about 350 m AOD to 210 m AOD within the OHL route and drop further to 50 m AOD within the underground cable route. The land use is mainly pasture and arable, with access via informal tracks and footpaths, with the eastern section of the underground cable route running along roads across the villages of Pen-y-coedcae and Church Village (**Figure 10A.1**).

Hydrology and Drainage

Wind Farm development

- 2.2.6 The Wind Farm development site extends over three hydrological catchments, the northern part draining to the Afon Rhondda Fawr, the southern part draining to the Nant Muchudd and a small section of the access road in the west draining to Afon Elai. The Afon Rhondda Fawr joins the Afon Taf 1.3 km east of the study area whilst Nant Muchudd joins Afon Elai 3.7 km south of the study area. A number of tributaries of the Afon Rhondda Fawr and Nant Muchudd issue within the study area. The Afon Rhondda Fawr, Afon Taf and Afon Elai are classified by NRW as Main Rivers whilst their tributaries are ordinary watercourses (Figure 10A.2).
- 2.2.7 The Afon Rhondda Fawr flows southeast within the northern edge of the study area. Six tributaries of the Afon Rhondda Fawr issue within the northern and western edges of the Wind Farm development site with additional tributaries issuing in the wider study area. One of these tributaries is Nant Gelliwion which flows to the east before joining the Afon Rhondda Fawr in Pontypridd. OS mapping shows that the Nant Gelliwion starts at the eastern end of the Wind Farm development site. During the site walkover on 24 August 2022, a culvert was observed where an existing footpath crosses the stream (NGR ST 04034 89207), but the watercourse was dry. This is likely due to low seasonal summer groundwater levels and low rainfall rates. Downgradient of this point was inaccessible due to trees and fencing so it is unclear where the non-ephemeral part of the stream starts flowing.
- 2.2.8 Two tributaries of Nant Muchudd issue within the southern edge of the Proposed Development site with several additional tributaries issuing in the wider study area. One of these tributaries is Nant Castellau which flows to the south and joins Nant Muchudd approximately 2.4 km south of the study area. OS mapping shows that the Nant Muchudd issues at a disused quarry south of a housing estate at Trebanog and flows towards the southeast, crossing the location of the proposed access track to the Wind Farm development at NGR ST 01918 89597 (Figure 10A.2). No flow was observed at the proposed crossing location during the site walkover on 24 August 2022 (NGR ST 01911 89618).
- 2.2.9 The OS map shows five springs issuing within the southern and eastern parts of the Wind Farm development area. The southern springs drain south to the Nant Muchudd, whilst the eastern springs drain east to the Nant Gelliwion. There are numerous springs in the wider study area, including a spring line to the west of the Wind Farm development area.

- 2.2.10 There are two ponds within the Wind Farm development, one at an elevation of 330 m AOD and a second which was recorded as dry during site visit on 29/04/2022 and 05/07/2022 at an elevation of around 350 m AOD. There are a further two ponds in the wider study area (Figure 10A.2). The ponds are described in more detail in Section 10.5 of the Draft ES Chapter.

Grid Connection

- 2.2.11 The Grid Connection Corridor extends over four hydrological catchments, the OHL section draining to the Nant Muchudd and the underground cable section draining (from west to east) to Afon Rhondda Fawr, Nant Clun and Afon Taf. The Afon Rhondda Fawr, Afon Taf and Nant Clun are classified by NRW as Main Rivers whilst their tributaries are ordinary watercourses (Figure 10A.2). The OS mapping shows that tributaries of Nant Gelliwion, Nant Muchudd and Nant Ty'r arlwydd (Ordinary Watercourses) cross the proposed underground cable route.
- 2.2.12 No ponds or springs have been identified along the Grid Connection Corridor, but this will be confirmed in the ES. A number of ponds and springs are present in the wider study area.

Geology, Hydrogeology and Soils

Wind Farm development

- 2.2.13 The BGS online geology mapping indicates that there are limited superficial deposits across the Wind Farm development area. These comprise localised areas of peat in the centre and Glacial Till in the north of the Wind Farm development area. Within the wider study area, superficial deposits are mainly present in valley floors as areas of alluvium (clay, silt, sand and gravel), Glaciofluvial Deposits (sand, and gravel), River Terrace Deposits (sand, and gravel) and Glacial Till (clay). The Afon Rhondda Fawr flows over alluvium deposits, Glaciofluvial Deposits, River Terrace Deposits and Glacial Till. The Nant Muchudd and its tributaries, Nant Gelliwion and Nant Castellau flow over Glacial Till.
- 2.2.14 The regional bedrock geology is dominated by a thick sequence of Carboniferous sedimentary rocks which are preserved in and around the South Wales Coalfield Basin, a structurally complex, west-northwest-trending trough-shaped structure that extends westwards into Pembrokeshire. These Carboniferous rocks include the Carboniferous South Wales Upper Coal Measures Formation which underlie the study area⁵. This is described as grey (productive) coal-bearing mudstones/siltstones with seat-earths and minor grey, quartz-rich sandstones, coals, and ironstones. There are numerous coal seams within the sequence, most of which have been worked. The South Wales Upper Coal Measures Formation beneath the Wind Farm development area comprises sandstones of the Brithdir and Rhondda Members and alternating bands of mudstone, siltstone and sandstone of the Rhonda Member. The Brithdir and Rhonda Members are described as Pennant Sandstones with thin mudstone/siltstone and seat-earth interbeds and mainly thin coals. In the wider study area, the Hughes Member (sandstone) is present to the south and the Llynfi Member (mudstone, siltstone and sandstone) is present to the west of the Proposed Development site. BGS boreholes in the centre of the Wind Farm development area describe the bedrock geology as cyclical layers of shale and coal.
- 2.2.15 The LANDIS mapping indicates that the Wind Farm development area is dominated by a very acidic loamy upland soil with a wet peaty surface. The peaty soils are associated with

⁵ NRW (2014) National Landscape Character. NLCA37. South Wales Valleys. [Online] Available at: <https://naturalresources.wales/media/682625/nlca37-south-wales-valleys-description-1.pdf> [Accessed 31 August 2022]

areas of blanket bog and marshy grassland. Surrounding this soil type and covering much of the wider study area is freely draining acid loamy soil. Soils to the south, southeast and west of the study area include a slowly permeable wet very acid upland soil with a peaty surface. Soils to the east of the study area and those associated with Afon Rhondda Fawr to the north of the study area comprise freely draining slightly acid loamy soils.

- 2.2.16 The South Wales Upper Coal Measures is classified by NRW as a Secondary A Aquifer. The superficial deposits alluvium, Glaciofluvial Deposits and River Terrace Deposits are also classified as Secondary A aquifers. Secondary A Aquifers are defined as “*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers*”. These are generally aquifers formerly classified as minor aquifers. The Till is classified as a Secondary Undifferentiated aquifer. This is assigned in cases where it has not been possible to attribute either category Secondary A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. The peat deposits are classified as unproductive strata reflecting the thin peat horizon's limited overall volume.
- 2.2.17 Within the Wind Farm development area, soils are dominated by a very acidic loamy upland soil with a wet peaty surface. The peaty soils are associated with areas of blanket bog and marshy grassland. Surrounding this soil type and covering much of the wider study area is freely draining acid loamy soil. Soils to the south, southeast and west of the study area include a slowly permeable wet very acid upland soil with a peaty surface. Soils to the east of the study area and those associated with Afon Rhondda Fawr to the north of the study area comprise freely draining slightly acid loamy soils.
- 2.2.18 A Phase 1 peat depth survey was undertaken by Wood during September 2021 as is discussed in detail **Chapter 11: Ground Conditions**. The survey indicated that the Wind Farm development area is generally not underlain by peat. However, a localised peat bog is present to the west of the summit of Mynydd y Glyn with depths ranging from 2.4m below ground level (bgl) to a maximum surveyed depth of at least 4.10m bgl. An additional Phase 1 peat depth survey is currently being undertaken and will be presented in the final submission of the ES.

Grid Connection

- 2.2.19 The OHL route is underlain by the South Wales Upper Coal Measures comprising the Brithdir Member (Pennant Sandstones with thin mudstone / siltstone and seat-earth interbeds and mainly thin coals). The underground cable route is underlain by the Brithdir Member and the Hughes Member (sandstone). There is some superficial cover, comprised of Glacial Till and alluvium at Upper Boat. The South Wales Upper Coal Measures and alluvium are classified by NRW as Secondary A Aquifers. The Till is classified as a Secondary Undifferentiated aquifer.
- 2.2.20 The LANDIS mapping indicates that soils in the OHL route are slowly permeable wet very acid upland soils with a peaty surface and freely draining acid loamy soils over rock. Soils in the underground cable route are slowly permeable seasonally wet acid loamy and clayey soils, freely draining acid loamy soils over rock and freely draining floodplain soils. The Phase 1 peat depth survey shows no peat along the OHL route. No peat depth survey information is available for the underground cable route (**Chapter 11: Ground Conditions**).

2.3 Development Proposals

2.3.1 The proposal is to construct and operate a wind farm of up to seven turbines and associated infrastructure, which would be located on Mynydd y Glyn to the west of Pontypridd. The key elements of the Proposed Development are shown on **Figure 10A.1** and are listed below. A more detailed description is provided in **Chapter 4: Description of Proposed Development** of the Draft ES.

- a maximum of seven wind turbines, each with a three-bladed rotor with a diameter of up to 136 m, a hub height of up to 97.5 m and maximum height to blade tip of 155 m;
- approximately 5.4 km of site access tracks would be required. The track construction would be approximately ~5 m wide, ~0.6 m deep (dependent of ground conditions), with a ~2 m grass verge either side;
- wind turbine foundations and crane pads: foundations would usually comprise a reinforced concrete base slab with dimensions of approximately 20 m diameter x 4 m depth. Each wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. This provides a stable base on which to lay down turbine components ready for assembly and erection, and to site the two cranes necessary to lift the three-tower section, nacelle and rotor into place. Areas for crane pads were identified to avoid sensitive ecology habitats, archaeological constraints and areas of steeper gradients where possible. The total area of hardstanding at each turbine location including the turbine foundations and the crane pad will be sized to suit the turbine manufacturer's requirements but will be approximately 2,500 m²;
- two temporary construction compounds (TCCs): these compounds would be a maximum of 50 m x 50 m in area but this may be reduced depending on site requirements at the start of the construction phase. Once the erection and commissioning of the wind turbines is complete, the main construction compound would be removed and the land reinstated;
- electrical connection: small transformers to be located either internally within the turbine towers or adjacent to each turbine in a small kiosk (5.0 m x 2.5 m x 2.5 m (L x W x H)) according to the selected turbine specification. Underground cables will link the turbines to each other and to the on-site substation. Detailed construction and trenching specifications will depend on the ground conditions encountered at the time, but typically cables would be laid in a trench ~750 mm deep and ~450 mm wide;
- on-site substation: The site substation would connect the wind farm into the national distribution system on site (to be via a 33 kv connection in the substation compound). The arrangement of the substation will depend on Western Power Distribution (WPD)'s requirements and shall be determined by the rating of the Grid Connection and requirement for a step-up transformer. The substation building (approximately 14 m x 10 m) would be a single storey building and would house metering, protection and control equipment, storage and welfare facilities; and
- grid Connection corridor: The connection is planned between the on-site substation and WPD electricity connection point at Upper Boat. This connection would comprise an OHL to the south-eastern red line boundary of the Wind Farm development, subsequently the line would be undergrounded to the WPD connection point at Upper Boat. The desk-based assessment of potential effects from the Grid Connection presented in this Draft FCA is based on the installation of a 33kV overhead line on wooden poles for 1.4km and undergrounded 33kV cable following the highway up to the connection point (7.1km).

2.3.2 The Wind Farm Development will be designed with an operational life of 30 years. At the end of this period the developer has three options; to decommission the wind farm and

dismantle and remove the turbines; to apply for an extension to the operating period using existing equipment; or apply to install new equipment on the site. For the purposes of this assessment, it is assumed that the wind farm would be decommissioned.

2.4 Planning Context

Introduction

- 2.4.1 The purpose of this section is to identify the key policy documents that define the scope of this assessment. The section is structured in a hierarchical order, from national policy down to local guidance.

National Policies

Technical Advice Note 15 (TAN15)⁶

- 2.4.2 Technical Advice Note 15: Development and Flood Risk (TAN15 – July 2004) was produced by the then Welsh Assembly Government (now the Welsh Government). TAN15 provides technical guidance which supplements the policy set out in Planning Policy Wales (Edition 11, December 2018) (Welsh Assembly Government, 2018) in relation to development and flooding, providing a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location, can be assessed. Consultation on an updated version of TAN15 has been completed (January 2020) and is due for adoption on 01 June 2023. The draft update includes a range of changes to the guidance, in particular it removes reference to the Development Advice Map (DAM) and refers to a Flood Map for Planning held by NRW (**Table 1.1**). However, the consultation draft clearly states that TAN15 (2004) remains current until such a time that the replacement is confirmed. TAN15 (2004) has therefore been used to underpin this assessment.
- 2.4.3 The updated FMfP mapping have been used as a further reference point for the assessment of flood risk to the site, given that this is understood to be a more contemporary dataset utilising the latest and improved datasets.

The National Strategy for Flood and Coastal Erosion Risk Management (FCERM) in Wales, Welsh Government

- 2.4.4 The National Strategy for FCERM in Wales, as required under the Flood and Water Management Act 2010, set out the management approach for risks associated with flooding and coastal erosion across Wales over a 10-year period. NRW are responsible for managing the flood risks from the main rivers and sea across Wales; whilst Local Authorities LLFAs are responsible for managing risks associated with surface water, groundwater, and ordinary watercourses.

Sustainable Drainage (SuDS) Statutory Guidance, Welsh Government⁷

- 2.4.5 The SuDS Statutory Guidance establishes the requirements of Schedule 3 of the Flood and Water Management Act 2010; a framework for the approval and adoption of surface

⁶ Welsh government- Technical Advice Note 15: Development and Flood Risk. [Online] Available at: <https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf> [Accessed 15 September 2022]

⁷ Welsh Government. 2019. *Sustainable Drainage (SuDS) Statutory Guidance*. [Online] Available at: <https://gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf> [Accessed 15 September 2022]

water management systems serving new developments. The SuDS Approval Bodies (SABs) are assigned under the same Act, which give local authorities the responsibility to approve drainage systems for new developments. The overall objective of the legislation is to deliver effective, multi-purpose SuDS, which would remain effective for the lifetime of the development.

Local plans and policies

2.4.6 Local plans and policies and relevant guidance to this FCA are summarised in **Table 2.1**.

Table 2.1 Local Plans, policies and guidance

| Policy/ Plan / Guidance | Column heading |
|--|---|
| Local Flood Risk Management Strategy (LFRMS), 2013, Rhondda Cynon Taf County Borough Council (RCTCBC) | The Rhondda Cynon Taf County Borough Council (RCTCBC) Flood Risk Management Strategy ⁸ (FRMS) notes that surface water and sewers are the primary local sources of flooding within the region. The strategy is used by RCTCBC to co-ordinate flood risk management across the region. The LFRMS has been used to inform section 3 of this report. |
| Flood Risk Management Plan, 2015, RCTCBC | The RCTCBC Flood Risk Management Plan ⁹ (FRMP) identifies that the primary source of flood risk which are relevant to this FCA, are associated with ordinary watercourses and intakes to existing surface water culverts and surface runoff. The FRMP also sets out how risk management authorities will work to manage flood risk. |
| Preliminary Flood Risk Assessment (PFRA), 2011, 2017 update, RCTCBC¹⁰ | The RCTCBC PFRA provides a high level overview of flood risk from local sources within the County Borough. Historic records of local flooding were utilised to assess flood risk. The PFRA process also identifies 'Flood Risk Areas' defined by key risk indicators and threshold values as laid out by the Welsh Government. Eight Flood Risk Areas have been defined in Wales, one of which falls within RCTCBC. This Flood Risk Area covers approximately 50% of RCTCBC (largely encompassing the valley bottoms) and includes part of the Proposed Development area. |
| Severn Preliminary Flood Risk Assessment (PFRA), 2018, Natural Resources Wales (NRW) and the Environment Agency (EA)¹¹ | The Severn PFRA was undertaken in December 2018. The document is used to inform management of the River Severn catchment in regard to flood risk and FRMPs developed by Local Authorities within the catchment. The catchment area is inclusive of the Rhondda Cynon Taf County Borough. |

⁸ The Rhondda Cynon Taf County Borough Council (RCTCBC) Flood Risk Management Strategy [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/localfloodriskmanagementstrategyv1.pdf> [Accessed 15 September 2022]

⁹ The Rhondda Cynon Taf County Borough Council (RCTCBC) Flood Risk Management Plan [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/FloodRiskManagementPlanFinal.pdf> [Accessed 21 September 2022]

¹⁰ The Rhondda Cynon Taf County Borough Council (RCTCBC) Preliminary Flood Risk Assessment [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/PreliminaryFloodRiskAssessment.pdf> [Accessed 11 October 2022]

¹¹ Severn Preliminary Flood Risk Assessment (PFRA) [Online] Available at: <https://cdn.naturalresources.wales/media/687716/pfra-severn.pdf> [Accessed 15 September 2022]

2.5 The Justification Test

- 2.5.1 TAN15 directs that preference to siting projects within Zone A must be given, then to Zone B where flooding from fluvial or tidal sources will be less of an issue. Projects should be directed away from Zone C, although where this is not possible the project will be subject to the tests set out in Sections 6 and 7 of TAN15.
- 2.5.2 The vast majority of the Proposed Development (including the entirety of the Wind Farm Development) is within DAM Zone A (see **Table 1.1** for DAM Zone definitions) and is therefore deemed to be compatible development as summarised in Section 9 of TAN15 (Summary of Policy Requirements). The Draft FCA and mitigation measures will need to demonstrate that there is no increase in flood risk elsewhere and consideration of the surface water requirements.
- 2.5.3 However, a short section of the Grid Connection (about 300 m of underground cable where it connects to the WDP connection point) intersects Flood Zones B and C1 near Upper Boat (**Figure 10A.4**). The associated vulnerability classification for this element of the development and associated construction works is 'Essential Infrastructure', which is compatible with the Flood Zone but subject to the Justification Test.
- 2.5.4 The vulnerability of the development elements and Flood Zone compatibility is presented in **Table 2.2**.

Table 2.2 Application of the TAN15 policy requirements

| Development type | Flood risk vulnerability classification | Flood Zones ¹ | Flood risk vulnerability and flood zone 'compatibility' |
|--|---|--------------------------|---|
| Construction Phase | | | |
| Temporary construction compound (including offices and welfare facilities) | Less Vulnerable | A | ✓ (No Justification Test required) |
| Construction and working areas | Less Vulnerable | A | ✓ (No Justification Test required) |
| Operational Phase | | | |
| Wind turbines | Highly Vulnerable | A | ✓ (No Justification Test required) |
| Substation | Highly Vulnerable | A | ✓ (No Justification Test required) |
| Grid Connection (OHL) | Highly Vulnerable | A | ✓ (No Justification Test required) |
| Grid Connection (underground cable) | | B and C1 | ✓ (Subject to Justification Test) |
| Access tracks | Less Vulnerable | A | ✓ (No Justification Test required) |

Notes:

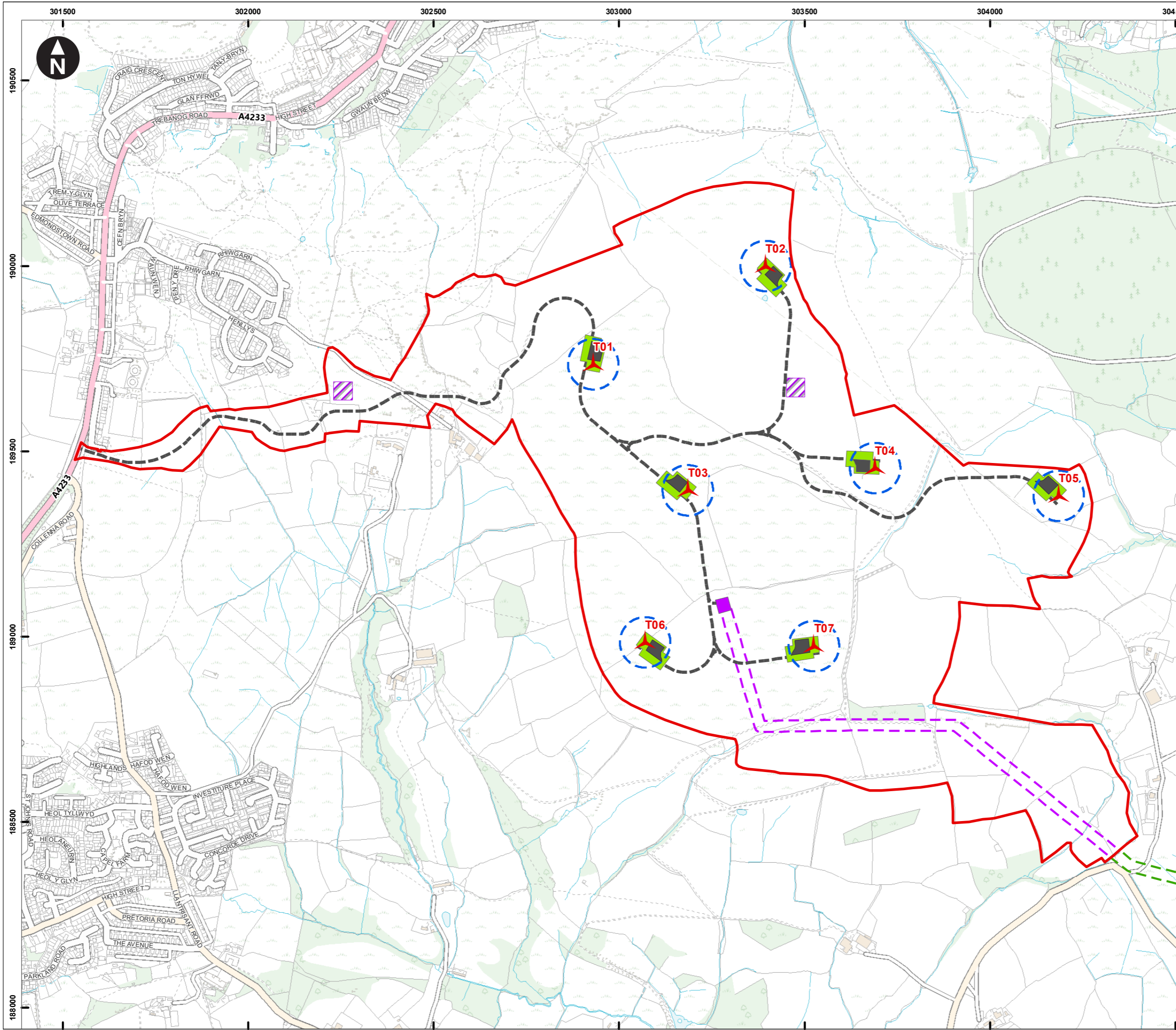
✓ Development is appropriate

X Development should not be permitted

1) Definition of flood zones is provided in Table 1.1

- 2.5.5 As the WPD connection point lies within Flood Zones B and C1 associated with Afon Taf, the underground cable needs to cross of a small area (about 300 m) of floodplain. A review of potential areas for the Proposed Development was undertaken during the design evolution process, as summarised in **Chapter 3: Need, Alternatives and Iterative Design**. This review took into account technical factors, including wind resource, electronic infrastructure, land value, land form, land cover and high level desk-based assessment of environmental impacts. The Proposed Development site was considered to offer a good combination of all assessment factors.
- 2.5.6 In addition, the risk of flooding to the underground cable during construction works can be managed with appropriate mitigation measures, as outlined in **Section 5**. Therefore, the Justification Test is considered to be passed.

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- Key
- Site boundary
 - Proposed turbine location
 - Rotor
 - Crane pad
 - Storage area
 - Access track
 - Construction compound
 - Electrical substation
 - Proposed grid connection overhead line
 - Proposed grid connection underground line

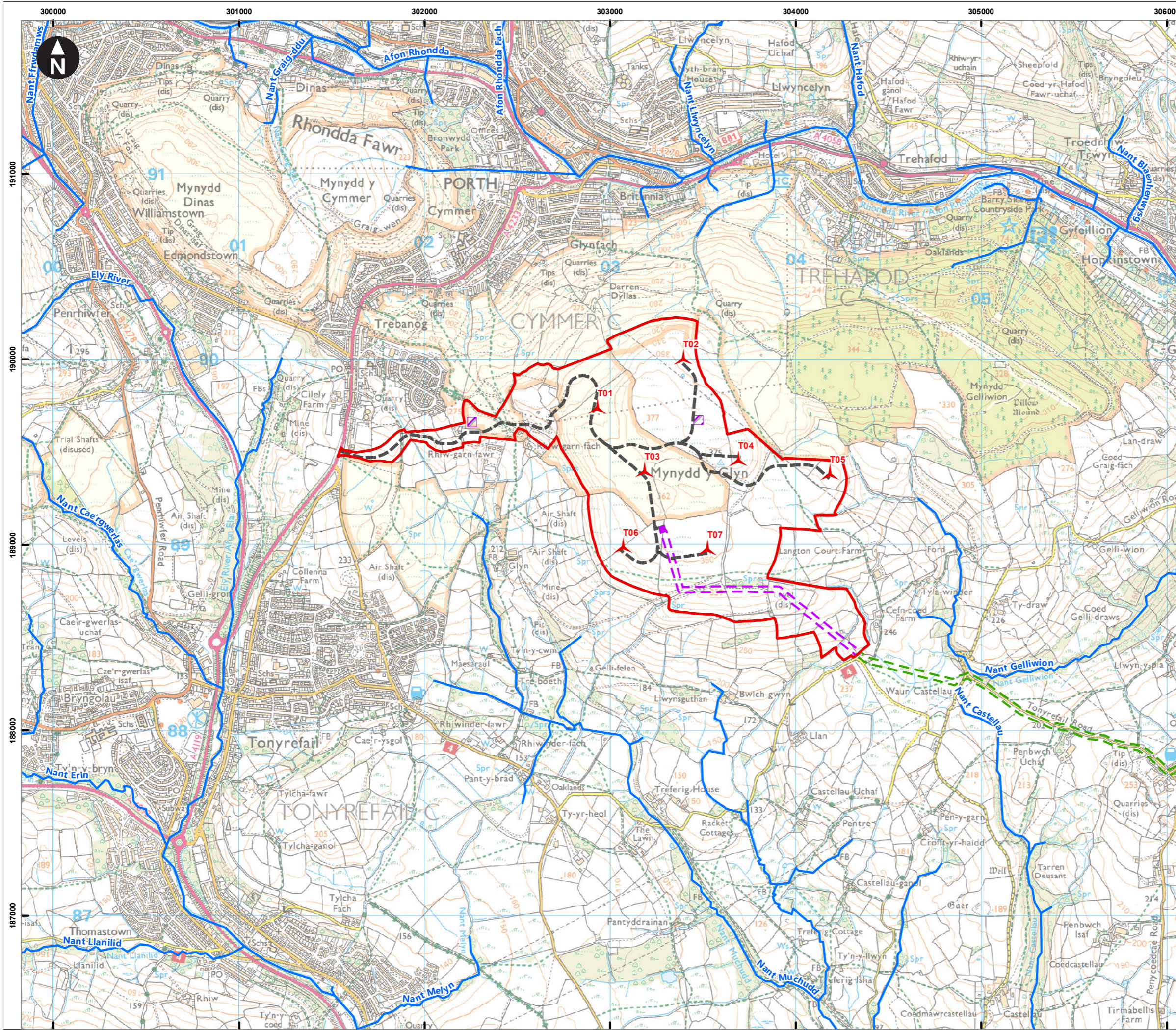
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Figure 10A.1a
Wind farm development - site layout

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Key

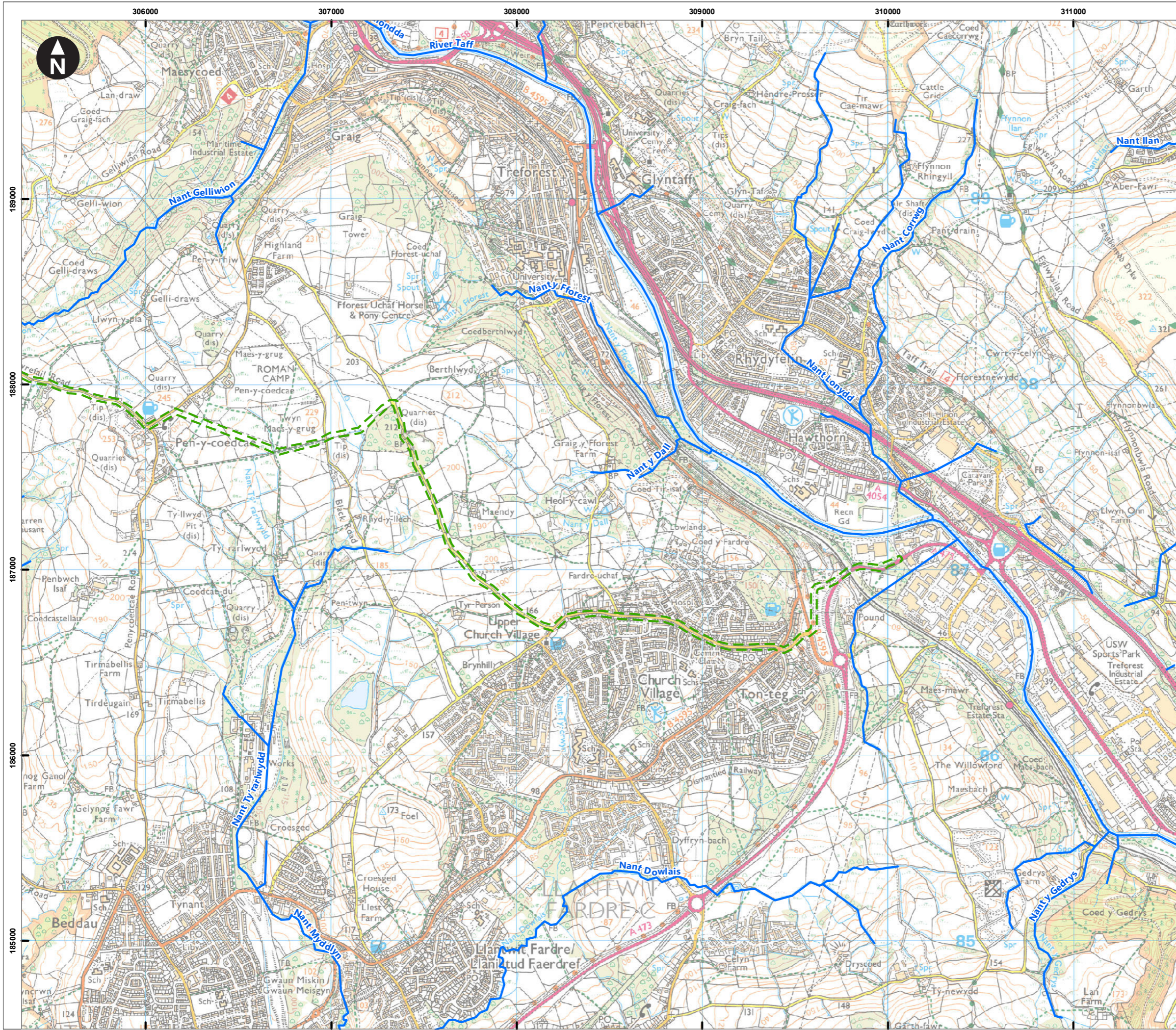
-  Site boundary
-  Proposed turbine location
-  Proposed grid connection overhead line
-  Proposed grid connection underground line
-  Access track
-  Temporary construction compound
-  Electrical substation
-  Watercourse









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**Figure 10A.1b
Proposed development location
(Wind farm development and grid connection)**

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- Key
-  Site boundary
 -  Proposed turbine location
 -  Proposed grid connection overhead line
 -  Proposed grid connection underground line
 -  Access track
 -  Temporary construction compound
 -  Electrical substation
 -  Watercourse

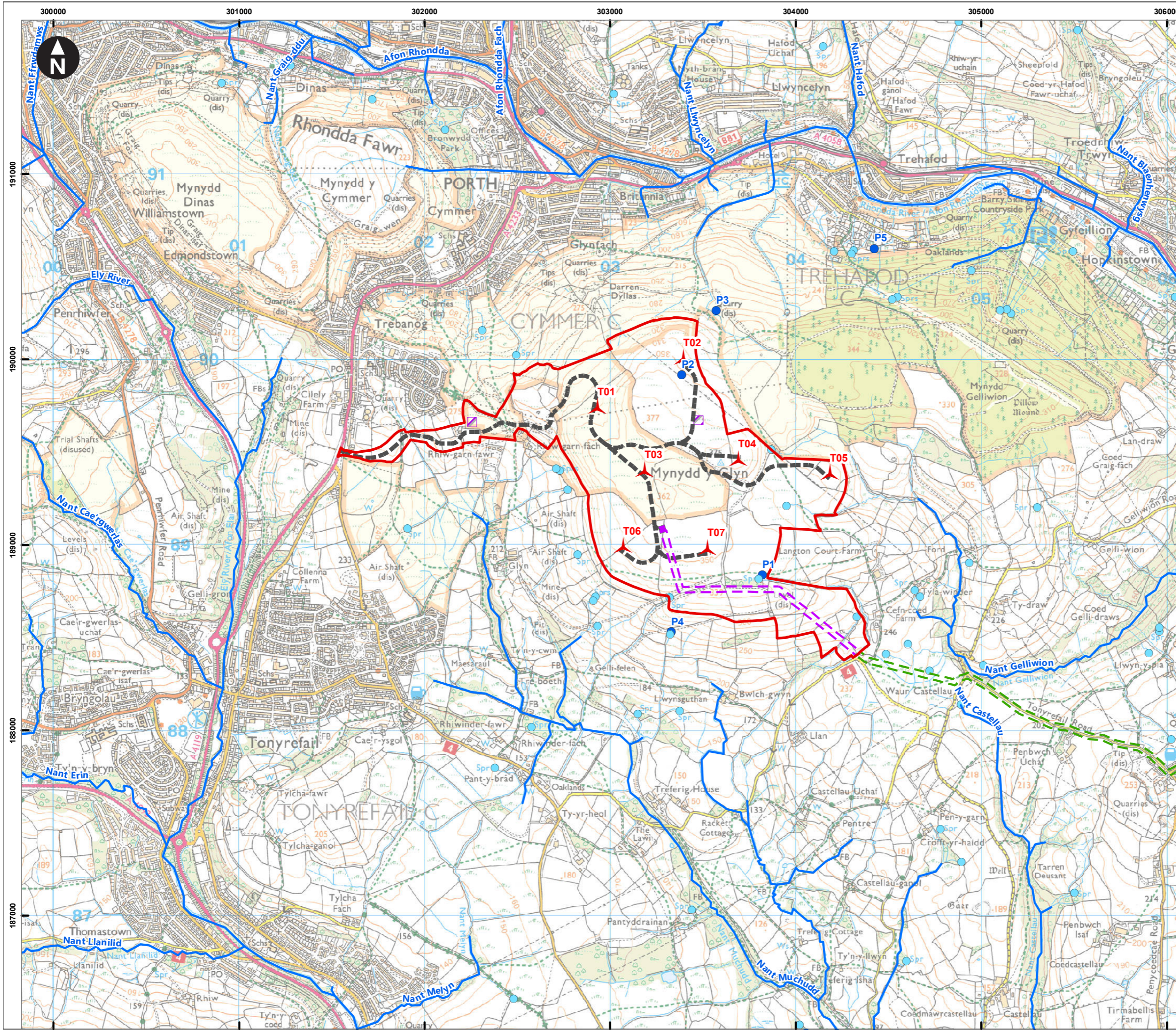
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Figure 10A.1c
Proposed development location
(Grid connection)

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Key


- Site boundary
- Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Temporary construction compound
- Electrical substation
- Watercourse
- Spring
- Pond

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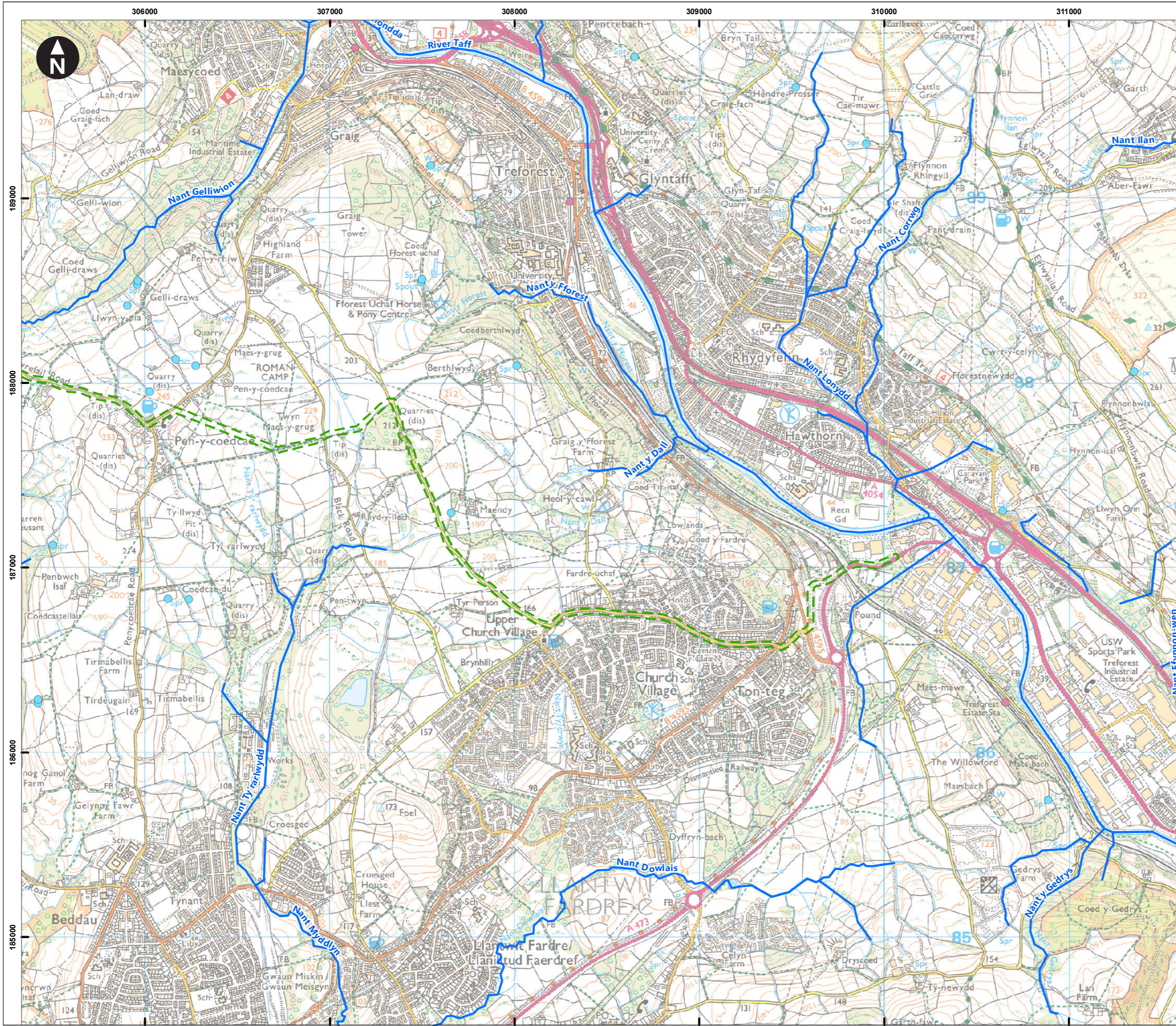
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**Figure 10A.2a
Water features
(Wind farm development and grid connection)**

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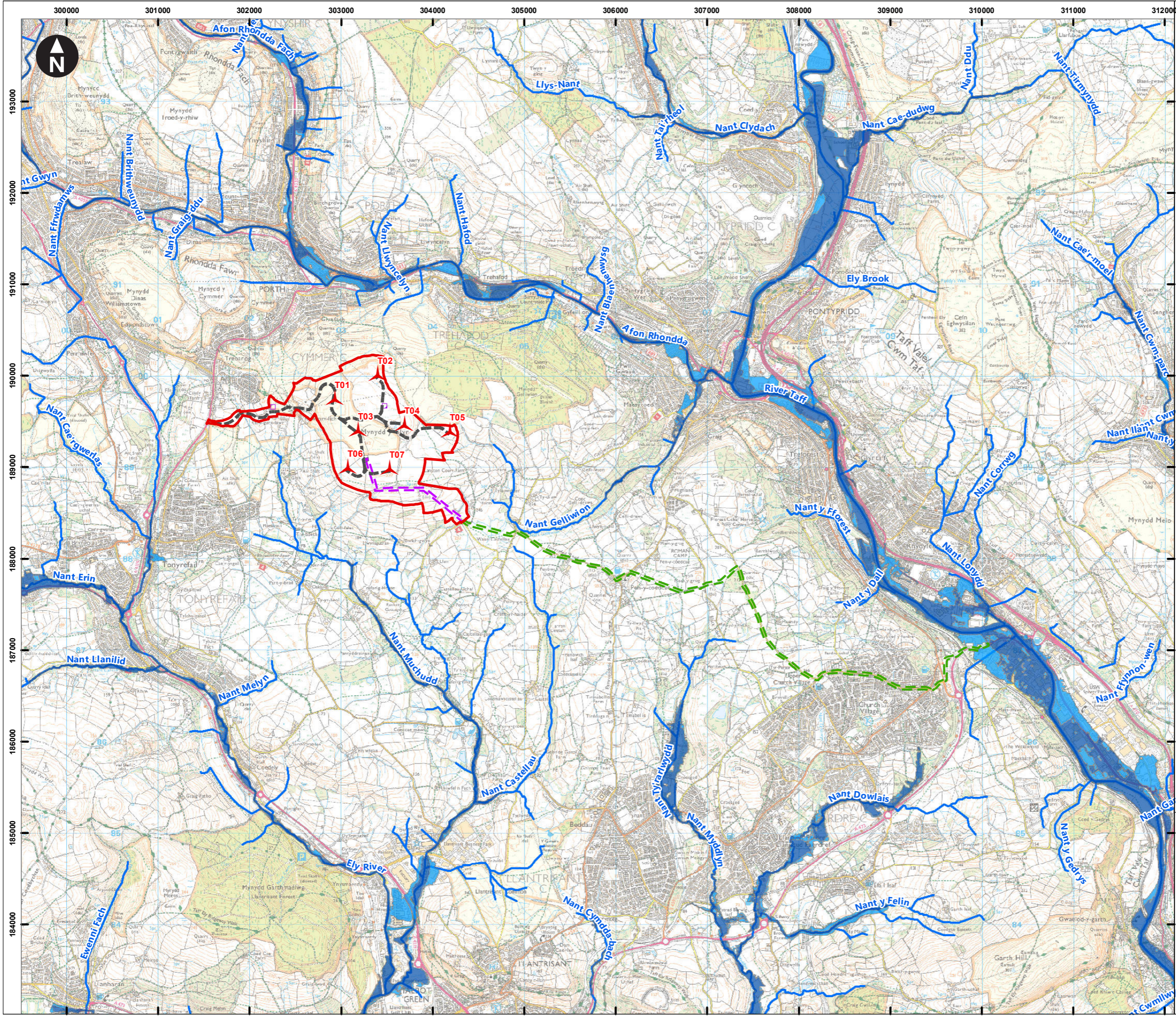
- Key
- Site boundary
 - ▲ Proposed turbine location
 - Proposed grid connection overhead line
 - Proposed grid connection underground line
 - Access track
 - Temporary construction compound
 - Electrical substation
 - Watercourse
 - Spring
 - Pond

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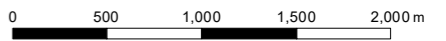
**Figure 10A.2b
 Water features
 (Grid connection)**





Key

- Site boundary
- ▲ Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Electrical substation
- Temporary construction compound
- Watercourse
- Flood Zone 2
- Flood Zone 3
- Flood Zone 1



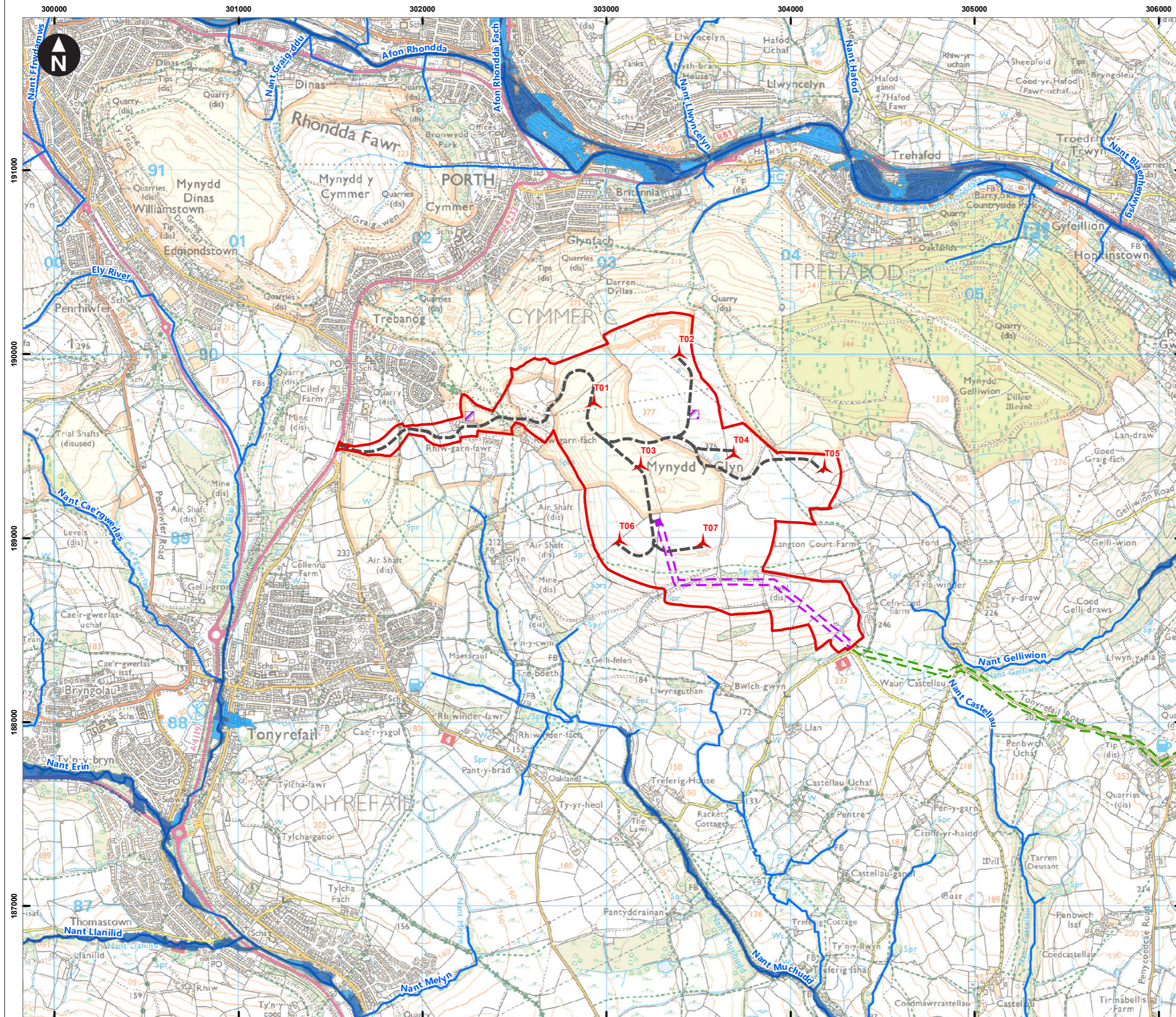
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Figure 10A.3 a
NRW Flood Map for Planning (Rivers and Sea)



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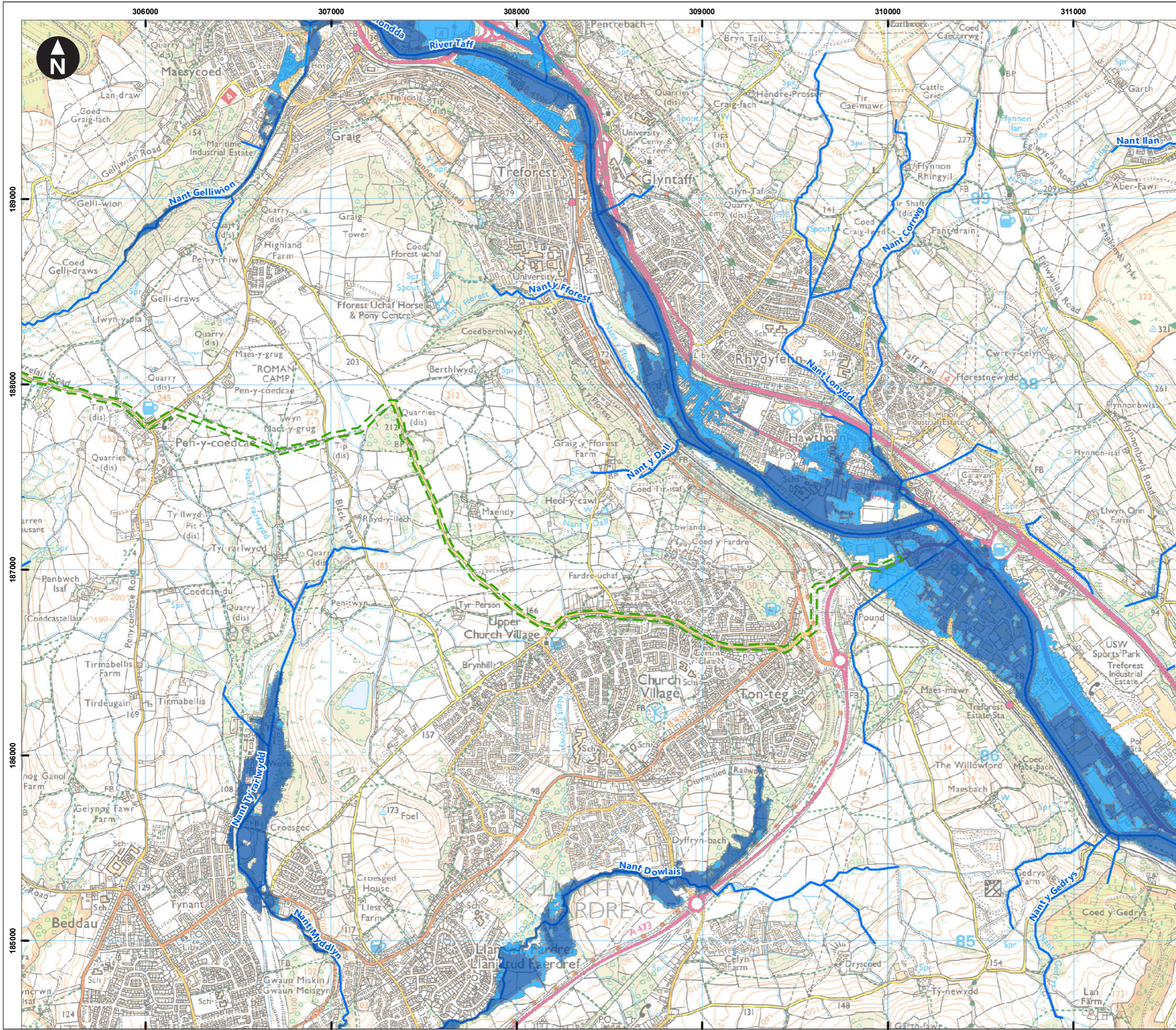
- Site boundary
- Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Electrical substation
- Temporary construction compound
- Watercourse
- Flood Zone 2
- Flood Zone 3
- Flood Zone 1

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Figure 10A.3 b
NRW Flood Map for Planning (Rivers and Sea)
(Wind farm development and grid connection)

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Key

-  Site boundary
-  Proposed turbine location
-  Proposed grid connection overhead line
-  Proposed grid connection underground line
-  Access track
-  Electrical substation
-  Temporary construction compound
-  Watercourse
-  Flood Zone 2
-  Flood Zone 3
-  Flood Zone 1

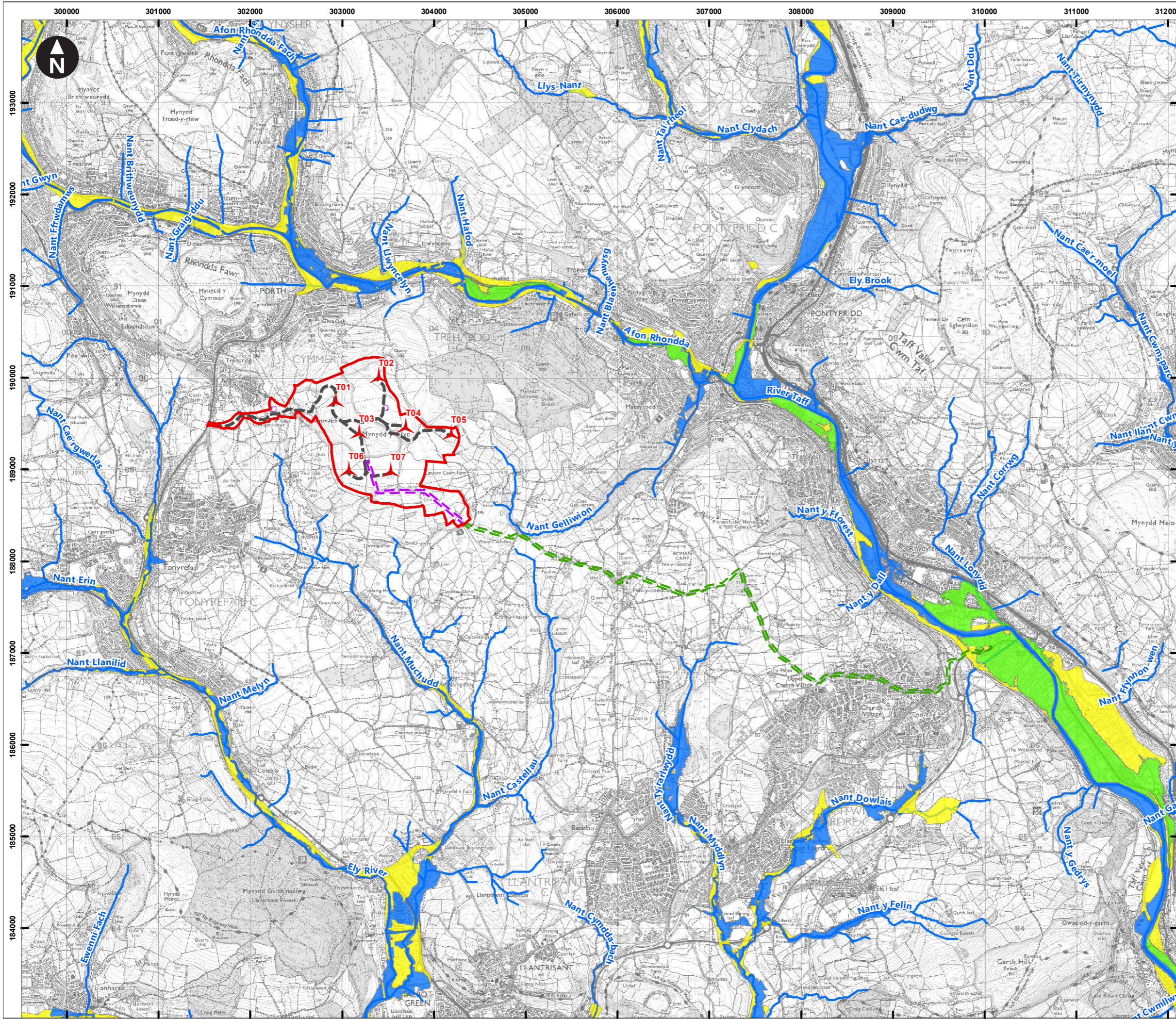
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Figure 10A.3 c
NRW Flood Map for Planning (Rivers and Sea)
(Grid connection)

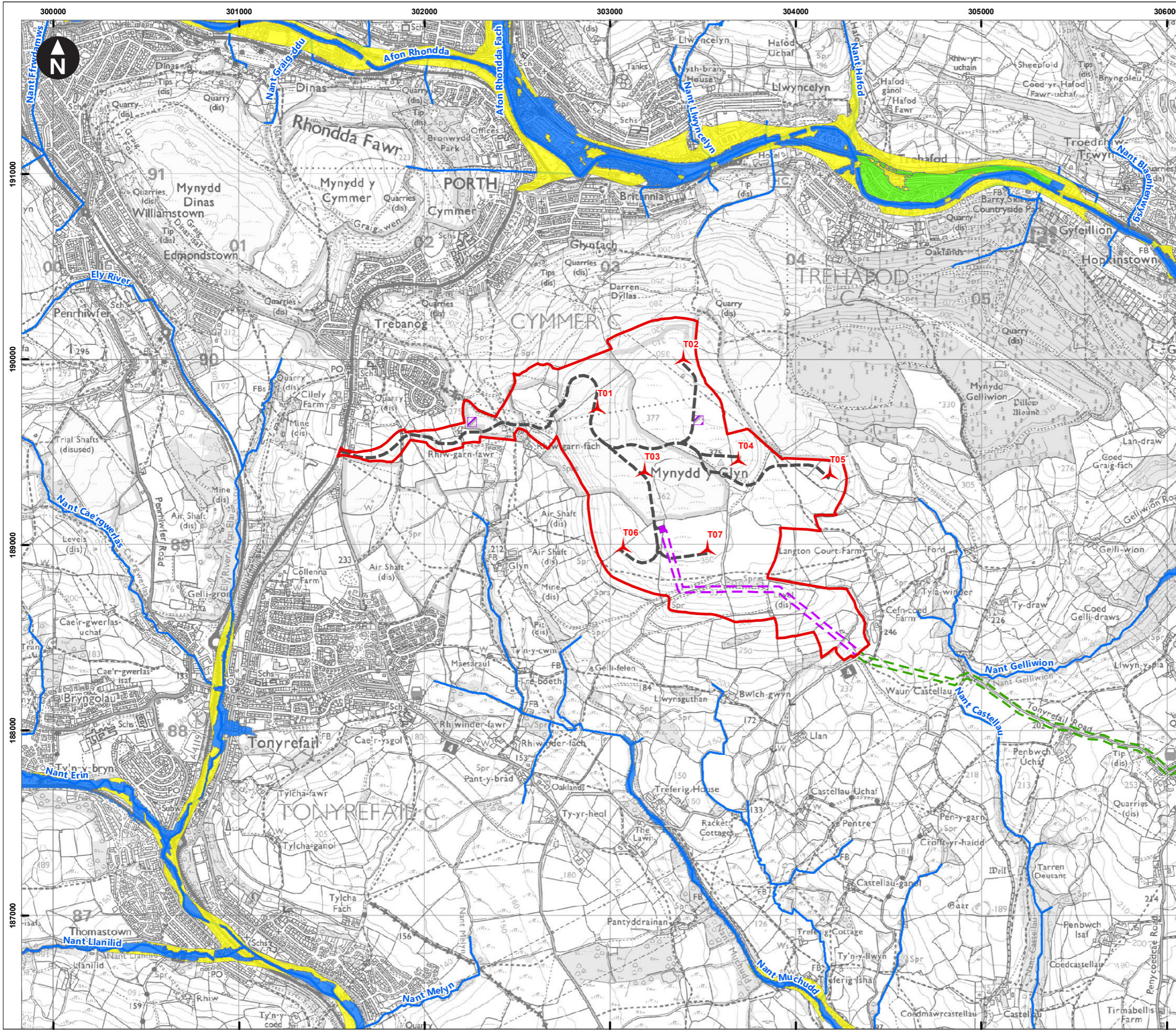


- Key
- Site boundary
 - ▲ Proposed turbine location
 - Proposed grid connection overhead line
 - Proposed grid connection underground line
 - Access track
 - Temporary construction compound
 - Electrical substation
 - Watercourse
 - Development Advice Map - Zone A
 - Development Advice Map - Zone B
 - Development Advice Map - Zone C1
 - Development Advice Map - Zone C2

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Figure 10A.4a
Development Advice Map (Flood Zones B, C1 and C2)



Key

- Site boundary
- ▲ Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Temporary construction compound
- Electrical substation
- Watercourse
- Development Advice Map - Zone A
- Development Advice Map - Zone B
- Development Advice Map - Zone C1
- Development Advice Map - Zone C2

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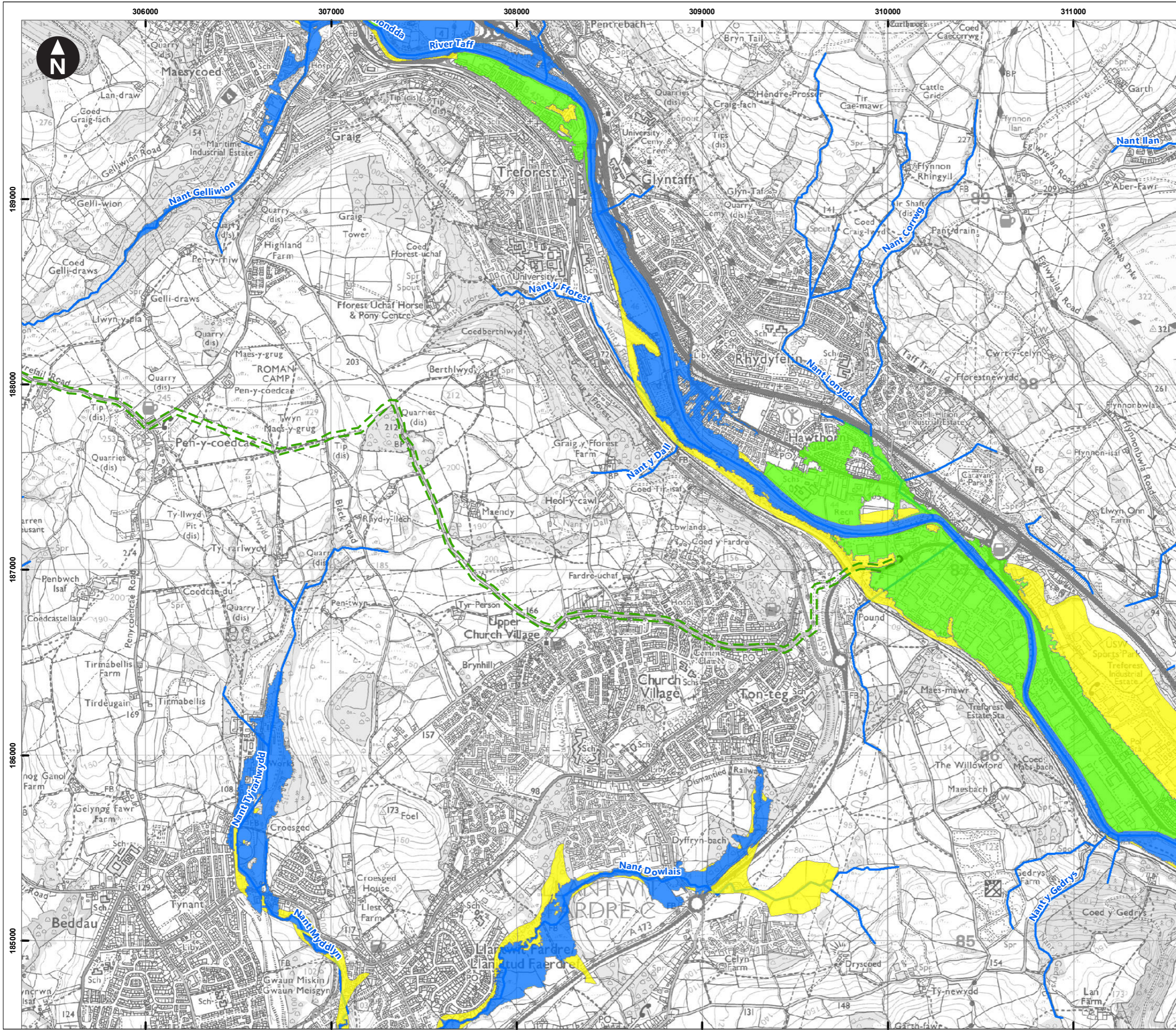
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Figure 10A4a
Development Advice Map (Flood Zones B, C1 and C2)
(Wind farm development and grid connection)

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Key

- Site boundary
- Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Temporary construction compound
- Electrical substation
- Watercourse
- Development Advice Map - Zone A
- Development Advice Map - Zone B
- Development Advice Map - Zone C1
- Development Advice Map - Zone C2

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Figure 10A.4c
 Development Advice Map (Flood Zones B, C1 and C2)
 (Grid connection)

3. Flood Risk Appraisal

3.1 Introduction

3.1.1 The assessment will use the source-pathway-receptor approach, whereby all three of those elements must exist for these to be a risk to be assessed. The presence of a source is initially screened in **Section 3.2** below. Where a potential source is identified, the risk itself is assessed with respect to the likelihood and consequence of flooding in the subsequent sub-sections. Where necessary, appropriate flood risk management measures are set out in **Sections 4** and **5** to address the identified risks.

3.2 Screening of all Potential Sources of Flood Risk

10.1.1 **Table 3.1** provides an initial screening of all potential flood risk across the site. Those that are screened in as posing a potential flood risk are then considered in the following sub-sections.

Table 3.1 Screening of all Potential Sources of Flood Risk

| Source of Flooding | Potential Connection to Proposed Development area | Screened In? |
|----------------------|--|--------------|
| Fluvial | <p>The DAM (Figure 10A.4) and FMfP (Figure 10A.3) shows that the Wind Farm development area lies entirely within an area of very low risk of fluvial flooding (Flood Zone A in the DAM and Flood Zone 1 in the FMfP). The Grid Connection Corridor also lies largely within an area of very low risk of fluvial flooding (Flood Zone A in the DAM and Flood Zone 1 in the FMfP) but a small section near the WPD connection point intersects areas of high risk at Upper Boat (Flood Zones B and C1 in the DAM and Flood Zones 2 and 3 in the FMfP) associated with the Afon Taf.</p> <p>Fluvial flooding is assessed in further detail in Section 3.4.</p> | Yes |
| Tidal | <p>The Proposed Development is located some distance from the sea and is at elevation of 210 to 350 m AOD (Wind Farm development) and 210 to 50 m AOD (Grid Connections).</p> <p>Owing to the lack of source, the risk of tidal flooding in the area is considered to be low and is not considered further in this assessment.</p> | No |
| Groundwater | <p>The Proposed Development is underlain by South Wales Upper Coal Measures which consists of a cyclical sequence of sandstone, mudstone, siltstone and coal seam layers (Secondary A aquifer).</p> <p>Groundwater flooding is assessed in further in Section 3.6.</p> | Yes |
| Surface water | <p>The Flood Risk Assessment Wales map – Flood risk from surface water and small watercourses (Figure 10A.5) shows that the majority of the Proposed Development area is at very low risk of flooding (0.1% AEP) from this source. However, there are several areas of mapped high risk (3.33% AEP), and therefore flooding from this</p> | Yes |

| Source of Flooding | Potential Connection to Proposed Development area | Screened In? |
|--------------------|---|--------------|
| | <p>source is considered further. Surface water runoff originating from the Proposed Development area also needs further consideration.</p> <p>Surface water flooding is assessed in detail in Section 3.5.</p> | |
| Sewer | <p>Most of the Proposed Development is situated away from developed areas and it is anticipated that there are few sewer drainage networks in the Proposed Development area within which water levels could feasibly rise to an extent that would result in flooding of the Site. Any flows surcharging from minor sewer systems associated with nearby farm buildings would be expected to be minimal/intercepted by the local watercourses. A small section of the Grid Connection (underground cable) follows an unnamed road across Church Village which joins the B4595. Whilst sewer flooding could occur in this area, any water that surcharged would drain to nearby more low lying areas to the southeast.</p> <p>Owing to the lack of source, the risk of sewer flooding in the area is considered to be low and is not considered further in this assessment.</p> | No |
| Artificial | <p>The NRW Reservoir Flood Risk Map (Figure 10A.6) shows that the Proposed Development is not located within an area of reservoir flood risk except for a small section of the Grid Connection near the WPD connection point.</p> <p>Artificial flooding is assessed in further detail in Section 3.7.</p> | Yes |

3.3 Historical Flooding

- 3.3.1 NRW's historical flood extent mapping indicates that there are no recorded flood incidents within the Proposed Development area. The closest recorded flood extent is a localised area associated with the Afon Taf approximately 300 m east of the WPD connection point.

3.4 Fluvial Flooding

Wind Farm development

- 3.4.1 The Wind Farm development site lies entirely within an area of very low risk of fluvial flooding (Flood Zone 1 in the FmfP, **Figure 10A.2**, and Flood Zone A in the DAM, **Figure 2.3**) owing to its location on an elevated summit (Mynydd y Glyn). This indicates that the Wind Farm development area is at negligible risk of fluvial flooding.

Grid Connection

- 3.4.2 The Grid Connection Corridor lies predominantly within an area of very low risk of fluvial flooding (Flood Zone 1 in the FMfP, **Figure 10A.2**, and Flood Zone A in the DAM, **Figure 10A.3**). However, a small section of the Grid Connection (underground cable) near the WPD connection point intersects areas of medium to higher risk at Upper Boat (Flood Zones 2 and 3 in the FMfP, **Figure 10A.2**, and Flood Zone B and C1 in the DAM, **Figure 10A.3**) associated with the Afon Taf. Flood defences are present along the Afon Taf but

are mapped as discontinuous in the area of the WPD connection point. The associated flood model for the Afon Taf was requested from NRW and will be used in the assessment for the final ES.

- 3.4.3 The underground cable will have no impact to flood risk receptors during its operation. There would also be no impact from maintenance activities, although flood risk to personnel carrying out maintenance activities during the operational phase are considered in **Section 5**. Embedded measures for mitigating the risks of fluvial flooding in the construction phase of the underground cable are also provided in **Section 5**.

3.5 Surface water flooding

Surface water run-on

- 3.5.1 The Flood Risk Assessment Wales map – Flood risk from Surface Water and Small Watercourses (FRfSWSW) (**Figure 10A.5**) gives an indication of the broad areas likely to be at risk of surface water flooding at present, i.e. areas where surface water would be expected to flow or pond. It defines areas at very low (less than 0.1% AEP), low (between 0.1% and 1% AEP), medium (between 1% and 3.3% AEP) and high (greater than 3.3% AEP) probability of surface water flooding. The mapping shows that most of the Proposed Development area is at very low risk of flooding from this source, reflective of the general topography of the area and locality across a ridge summit. However, there are several regions of mapped higher risk, discussed further in the subsections below.
- 3.5.2 The mapping shows a surface water flow pathway of low to medium flood risk starting at approximately 370 m AOD in the east of the Wind Farm development area and draining east towards Nant Gelliwion. This surface water flow pathway crosses the proposed access track between Turbines 4 and 5 (**Figure 10A.5**). The closest areas of high flood risk are associated with the Afon Ebwy 0.15 km to the west of the Grid Connection corridor and the Afon Ebwy Fach 0.25 km to the east of the Wind Farm development.

Wind Farm Development

- 3.5.3 The FRfSWSW has been used to further inform the flood risk associated with minor watercourses and tributaries for Nant Muchudd in the south and west, Nant Gelliwion in the east and Afon Rhonda Fawr in the north as these smaller watercourses are not included within the FRfR and DAM mapping. The mapping indicates narrow bands of low to high risk (>3.3% AEP) through the Wind Farm development area, coincident with these watercourses centrelines. The proposed access tracks cross surface water flow pathways associated with tributary Nant Muchudd (2 crossings) to the west and with Nant Gelliwion (3 crossings) to the east of the Wind Farm development area (**Figure 10A.2**). This has the potential to impact on flow conveyance and increase local flood risk. During a site walkover survey on 24 August 2022, the surface water flow pathway associated with Nant Muchudd was not flowing whilst the surface water flow pathway associated with Nant Gelliwion was dry. Potential mitigation to assist in conveying flows (consistent with the existing flow pathways) is discussed in **Section 5**.
- 3.5.4 Some narrow regions of Low (0.1 to 1% AEP) flood risk are also mapped in depressions within the Wind Farm development area but these do not intersect proposed development elements.

Grid Connection corridor

- 3.5.5 The FRfSWSW indicates that the Grid Connection Corridor crosses narrow bands of low to high risk (>3.3% AEP), coincident with the centrelines associated with minor watercourses. The OHL route crosses the tributaries of the Nant Muchudd (2 crossings) to the south whilst the underground cable crosses tributaries of the Nant Gelliwion (2 crossings) to the north and Nant Ty'r arlwydd and Nant Dowlais (4 crossings) to the south. Construction works have the potential to impact on flow conveyance and increase local flood risk. Potential mitigation to assist in conveying flows (consistent with the existing flow pathways) is discussed in **Section 5**.
- 3.5.6 Some narrow regions of Low (0.1 to 1% AEP) flood risk are also mapped in depressions in the wider area but these do not intersect the Grid Connection Corridor.

Surface water runoff

- 3.5.7 The temporary and permanent changes in ground cover associated with the Proposed Development have the potential to increase the overall extent of lower permeability surfaces. In the absence of effective surface water management measures, this could lead to a temporary increase in peak runoff rates and a consequent increase in flood risk to third party receptors downstream. To address this, surface water management measures will be implemented, as discussed in **Section 4** and **5**.
- 3.5.8 For the construction phase, such changes in ground cover would be associated with the wind turbine crane pads, TCC and internal access tracks. For the operational phase, such changes would be associated with the turbine foundations and crane pads, substation and internal access tracks (the Grid Connection poles would have a negligible footprint and the TCC would be restored to its land previous use).
- 3.5.9 The flood risk receptors associated with the potential effects of increased runoff from the Proposed Development are identified in **Table 3.2** and shown in **Figure 10A.7**. These have been considered based on review of existing surface water flood risk, proximity to the Proposed Development, and review of topography to determine whether detrimental impacts arising from the development could impact the receptor.

Table 3.2 Screening of all Potential Sources of Flood Risk

| Flood risk receptor | Reference in Figure 10A.7 |
|---|---------------------------|
| Residential properties, industry/business properties located in and around Porth | FR1 |
| Residential properties, industry/business properties located in and around Trebanog | FR2 |
| Residential properties, industry/business properties located in and around Trehafod | FR3 |
| Residential and farm buildings at Langton Court Farm | FR4 |
| Residential and farm buildings at Tyla-winder Farm | FR5 |
| Residential buildings at Bwlch-gwyn | FR6 |

| Flood risk receptor | Reference in Figure 10A.7 |
|---|---------------------------|
| Residential buildings at Glyn | FR7 |
| Residential buildings at Rhiw-garn-fach | FR8 |
| Residential buildings at Rhiw-garn-fawr | FR9 |
| Residential and farm buildings at Llan | FR10 |
| Residential and farm buildings at Pen-y-garn | FR11 |
| Residential and farm buildings at Crofft-yr-haidd | FR12 |
| Residential and farm buildings at Penbwch Uchaf | FR13 |
| Residential buildings at Pen-y-coedcae | FR14 |
| Residential and farm buildings at Penbwch Isaf | FR15 |
| Residential and farm buildings at Tirmabellis | FR16 |
| Residential and farm buildings at Ty'llwyd | FR17 |
| Residential and farm buildings at Ty'rarlwydd | FR18 |
| Residential and farm buildings at Berthlwyd | FR19 |
| Residential and farm buildings at Maendy | FR20 |
| Residential and farm buildings at Rhyd-y-llech | FR21 |
| Residential and farm buildings at Heol-y-cawl | FR22 |
| Residential and farm buildings at Tyr-Person | FR23 |
| Residential properties, industry/business properties located in and around Church Village | FR24 |
| Industry/business properties located in Treforest Industrial Estate | FR25 |

3.6 Groundwater Flooding

- 3.6.1 Groundwater flooding occurs as a result of water issuing to the surface from the underlying aquifers. This tends to occur after long periods of sustained high rainfall, with areas most at risk being situated on permeable geology and low-lying compared to the local water table.
- 3.6.2 Rhondda Cynon Taf County Borough Council Local Flood Risk Management Strategy (2013)¹² states there is little documented evidence of groundwater flooding within the borough area.

¹² The Rhondda Cynon Taf County Borough Council (RCTCBC) Flood Risk Management Strategy [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/localfloodriskmanagementstrategyv1.pdf> [Accessed 15 September 2022]

- 3.6.3 The Wind Farm development area and Grid Connection corridor have limited superficial cover (comprised of localised areas of peat in the centre and Glacial Till). Local BGS boreholes show that the underlying bedrock (Carboniferous South Wales Upper Coal Measures Formation) consist of a cyclical sequence of sandstone, mudstone, siltstone and coal seam layers. The Carboniferous South Wales Upper Coal Measures Formation is classified as a Secondary A aquifer. BGS borehole ST08NW111 (NGR is ST 01324 89203) about 700 m south of the Wind Farm Development shows a standing water level at 2.2m below ground level.
- 3.6.4 The potential for encountering groundwater during excavations is considered to be limited (**Chapter 11: Ground Conditions**). Where groundwater may be encountered, it is likely to be perched and in small quantities. This is due to the Proposed Development area being at a topographic high and the underlying geology comprising bands of both higher and lower permeability bedrock layers. This is also consistent with the EA Areas Susceptible to Groundwater Flooding Map¹³ which shows that the risk of groundwater flooding in the Proposed Development area is less than 25%.

3.7 Artificial Flooding

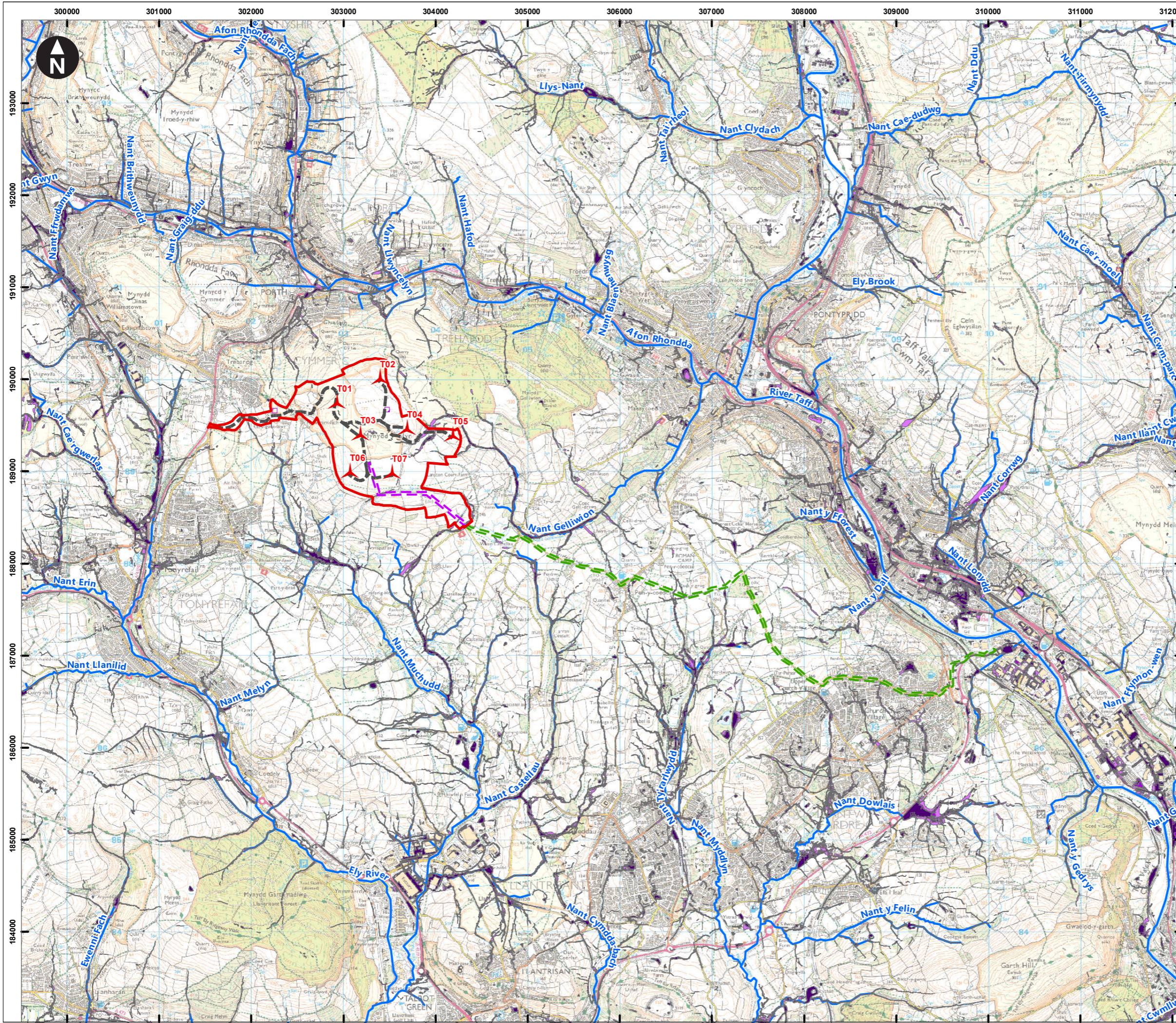
Wind Farm development

- 3.7.1 The NRW Reservoir Flood Risk Map (**Figure 10A.6**) shows that the Proposed Development is not located within an area of reservoir flood risk. In the wider area, flooding from artificial sources is predicted along the Afon Rhondda Fawr and Afon Taf associated with breach/failure of reservoirs to the north of the Proposed Development. No raised bodies of water are proposed as part of the development.
- 3.7.2 Owing to the lack of source, the risk of artificial flooding in the Wind Farm development area is considered to be low and is not considered further in this assessment.

Grid Connection

- 3.7.3 The NRW Reservoir Flood Risk Map (**Figure 10A.6**) shows that the Grid Connection Corridor is not located within an area of reservoir flood risk, except for a small section of underground cable which is within the reservoir flood extent along the Afon Taf associated with breach/failure of reservoirs to the north of the Proposed Development. No raised bodies of water are proposed as part of the development. Embedded measures to mitigate against the risk of artificial flooding are discussed in **Section 5**.

¹³ Provided as Figure 6 in Rhondda Cynon Taf County Borough Council (2013) Local Flood Risk Management Strategy [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/LocalFloodRiskManagementStrategy.aspx> [Accessed 14 September 2022]



Key

- Site boundary
- Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Temporary construction compound
- Electrical substation
- Watercourse

Flood Risk from surface water and small watercourses

- High
- Medium
- Low

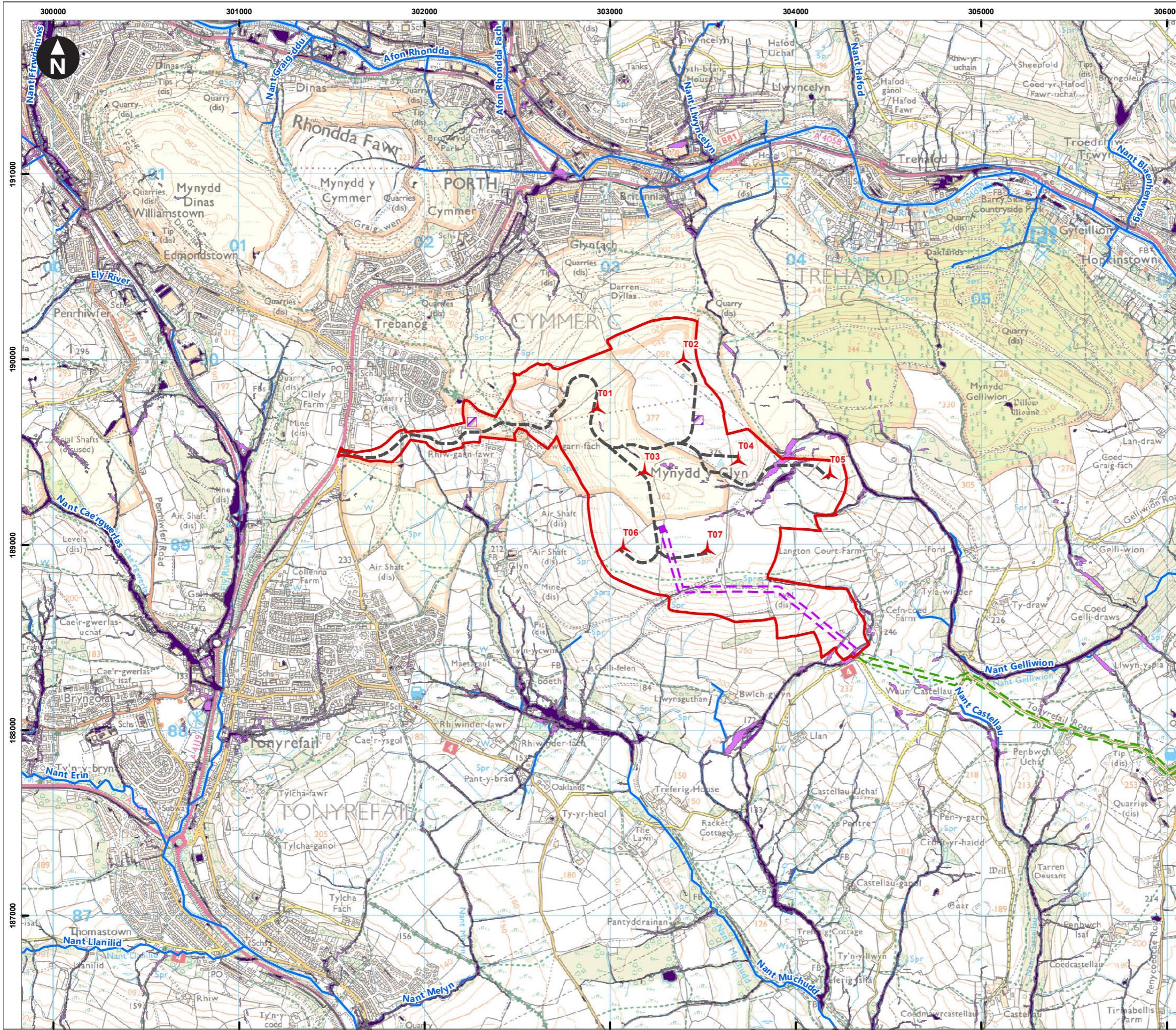
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Figure 10A.5 a
Flood Risk Assessment Wales map -
Flood Risk from surface water and small
watercourses



Key

- Site boundary
- ▲ Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Temporary construction compound
- Electrical substation
- Watercourse

Flood Risk from surface water and small watercourses

- High
- Medium
- Low

0 250 500 750 1,000 m

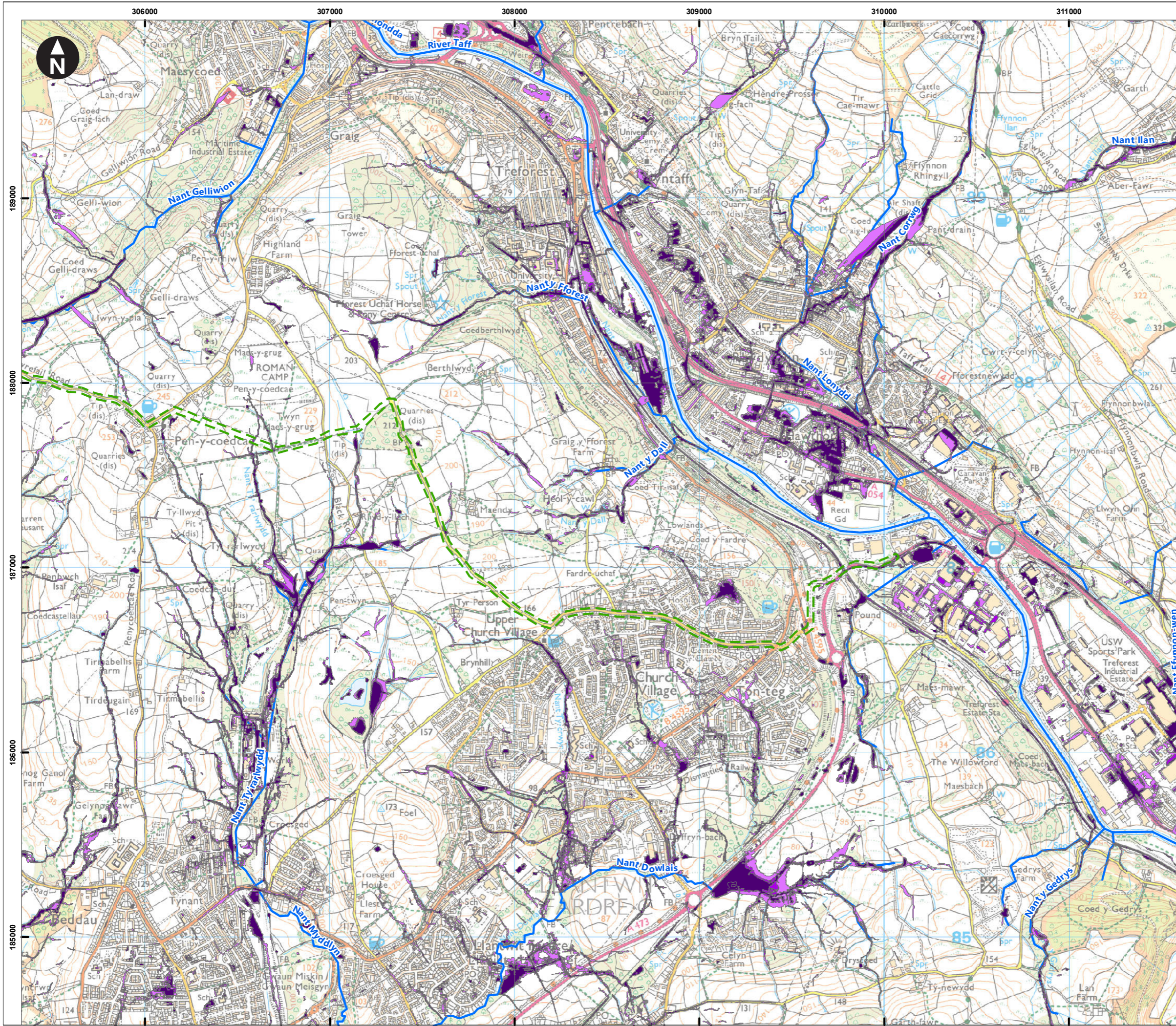
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**Figure 10A.5 b
Flood Risk Assessment Wales map -
Flood Risk from surface water and small
watercourses
(Wind farm development and grid connection)**

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Key

- Site boundary
- ▲ Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Temporary construction compound
- Electrical substation
- Watercourse

Flood Risk from surface water and small watercourses

- High
- Medium
- Low

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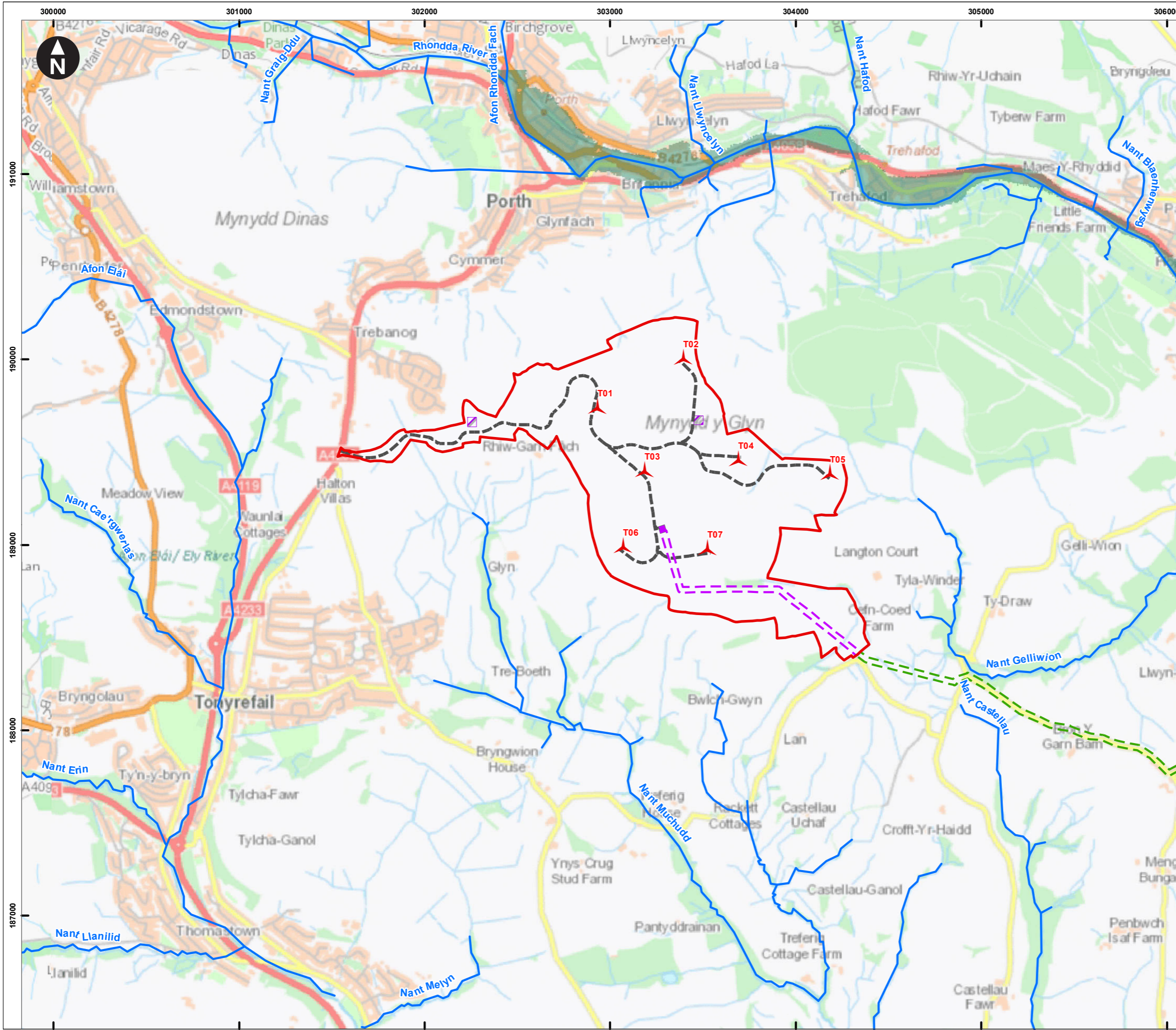
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Figure 10A.5 c
Flood Risk Assessment Wales map -
Flood Risk from surface water and small
watercourses
(Grid connection)

October 2022



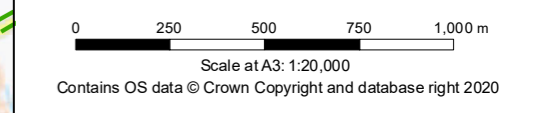
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Key

- Site boundary
- Proposed turbine location
- Access track
- Temporary construction compound
- Electrical substation
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Watercourses
- Flood risk from reservoirs

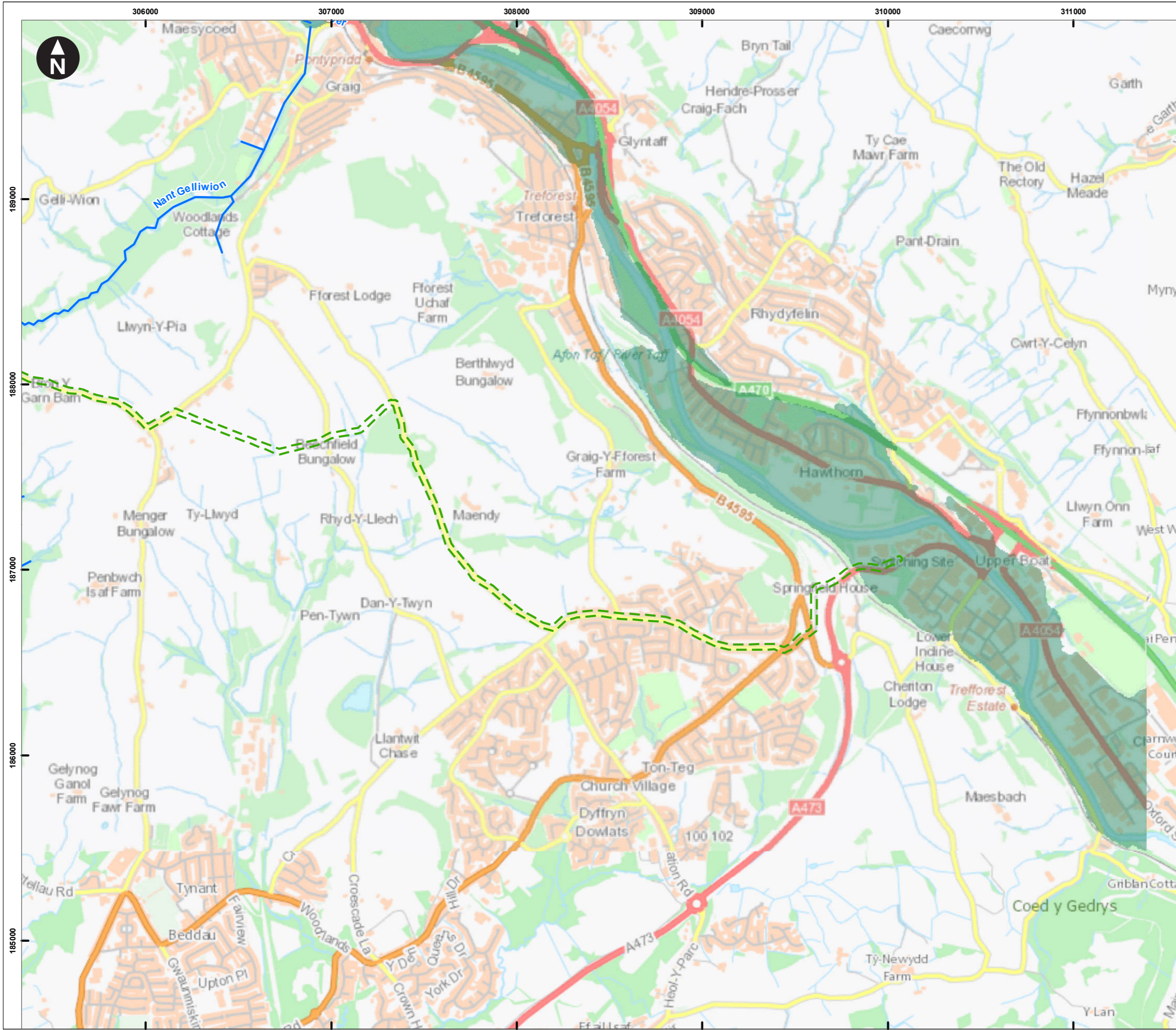
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Figure 10A.6 a
Flood Risk Assessment Wales map -
Flood Risk from reservoirs
(Wind farm development and grid connection)

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Key

- Site boundary
- ▲ Proposed turbine location
- Access track
- Temporary construction compound
- Electrical substation
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Watercourses
- Flood risk from reservoirs


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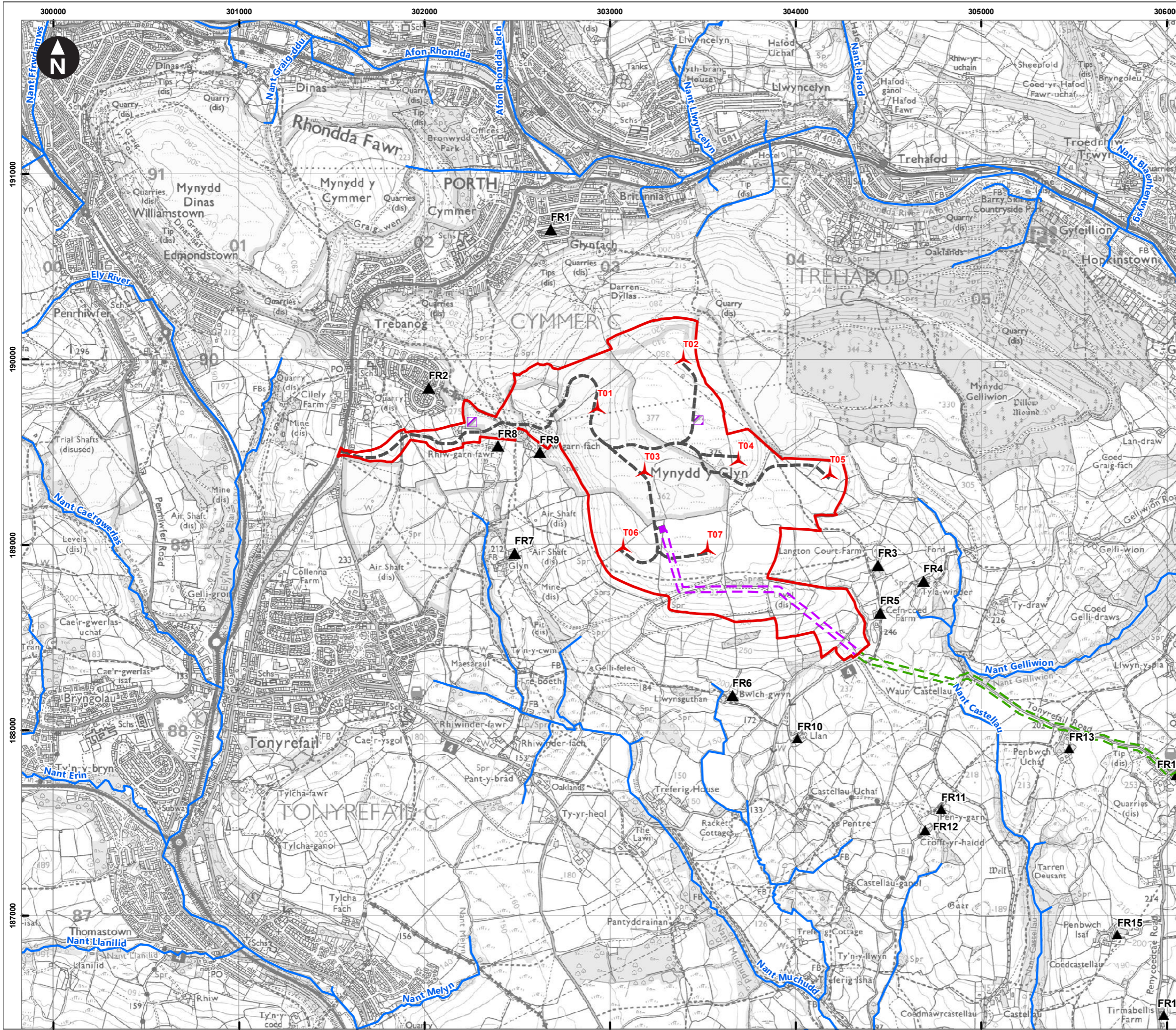
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Figure 10A.6 b
Flood Risk Assessment Wales map -
Flood Risk from reservoirs
(Grid connection)

October 2022



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Key

- Site boundary
- ▲ Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Watercourse
- Temporary construction compound
- Electrical substation
- ▲ Flood risk receptor

Note:
AQ1 (SE Valleys Carboniferous Coal Measures Aquifer) underlies the entirety of the study area.

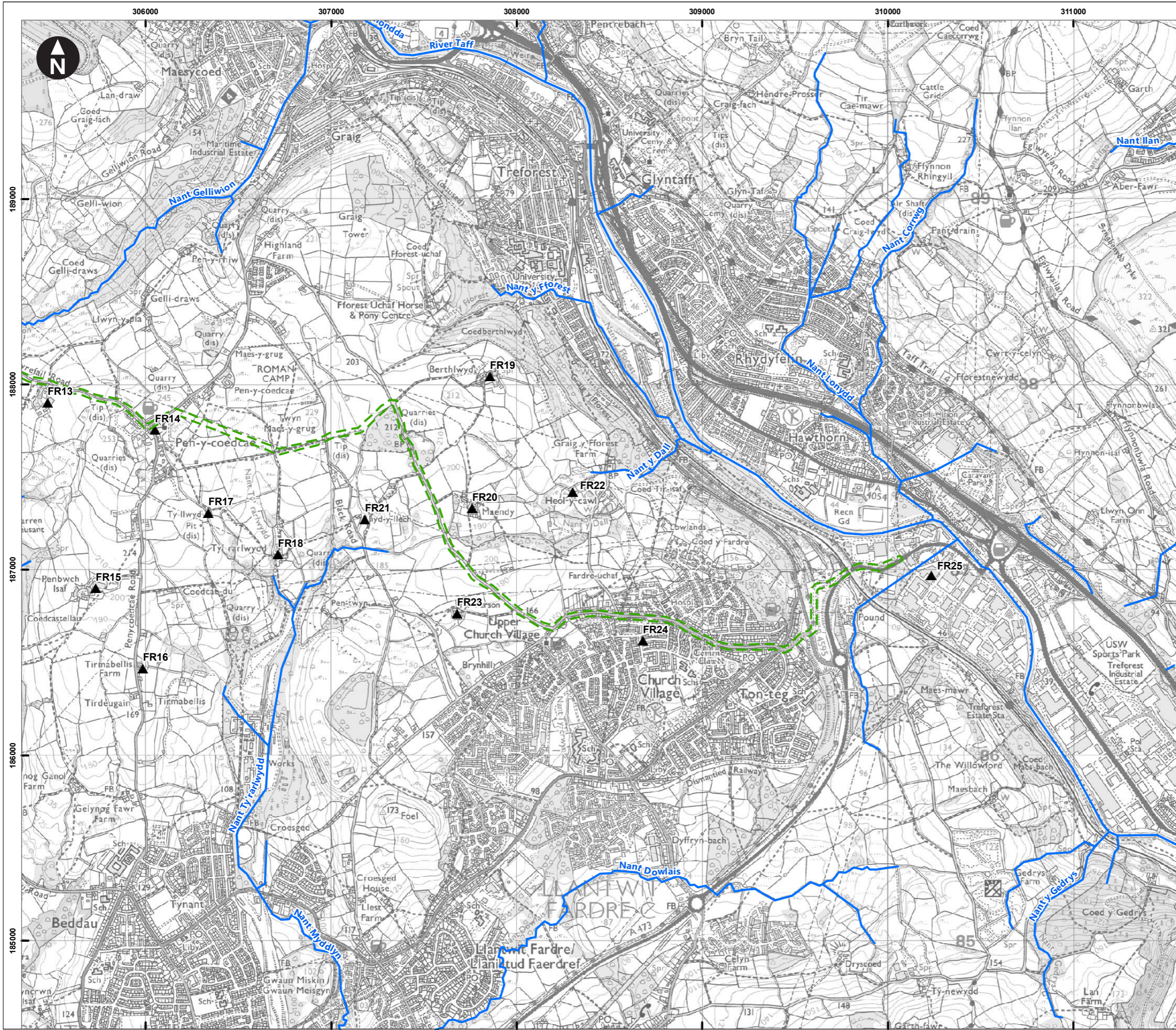
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**Figure 10A.7a
Flood risk receptors
(Wind farm development and grid connection)**



Key

- Site boundary
- ▲ Proposed turbine location
- Proposed grid connection overhead line
- Proposed grid connection underground line
- Access track
- Watercourse
- Temporary construction compound
- Electrical substation
- ▲ Flood risk receptor

Note:
AQ1 (SE Valleys Carboniferous Coal Measures Aquifer) underlies the entirety of the study area.

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**Figure 10A.7b
Flood risk receptors
(Grid connection)**

4. Outline Drainage Strategy

4.1 Introduction

- 4.1.1 This section sets out the outline strategy for managing runoff from the Proposed Development in a sustainable manner, in accordance with the requirements to manage surface water flood risk on-site, not increase flood risk elsewhere, and where possible, reduce flood risk overall. Surface water quality matters are addressed in **Chapter 10: Water Environment** of the Draft ES.

4.2 Overview of Drainage Strategy Scope

- 4.2.1 The need for sustainable surface water management for the Proposed Development is set out in TAN15¹⁴, Sustainable Drainage (SuDS) Statutory Guidance¹⁵ and the Defra Non-Statutory Technical Standards for Sustainable Drainage Systems¹⁶. Best practice guidance is provided in the CIRIA SuDS manual¹⁷. At the local level, guidance is provided by RCTCBC as the LLFA, who have prepared the following documents: Flood Risk Management Strategy¹⁸ and Flood Risk Management Plan¹⁹.
- 4.2.2 The creation of the hardstanding surfaces associated with the buildings and vehicle movement areas within the Wind Farm development has the potential to increase surface water runoff rates, volumes and pathways. The creation of temporary and new permanent infrastructure associated with the Grid Connection must also be considered. Appropriate management of surface water will therefore be necessary to ensure risks to on-site and off-site (downgradient) third party receptors are appropriately addressed.
- 4.2.3 A water management system will be designed for the site to address surface water runoff (surface water originating from within the site); surface water run-on (surface water originating from outside of the Site, if any); and any groundwater ingress (which it is anticipated would be dealt with alongside surface water).

¹⁴ Welsh government- Technical Advice Note 15: Development and Flood Risk. [Online] Available at: <https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf> [Accessed 15 September 2022]

¹⁵ Welsh Government. 2019. *Sustainable Drainage (SuDS) Statutory Guidance*. [Online] Available at: <https://gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf> [Accessed 15 September 2022]

¹⁶ Defra. 2015. *Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems*. [Online] Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf [Accessed 15 September 2022]

¹⁷ CIRIA. 2015. CIRIA SuDS Manual. [Online] Available at: <https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS> [Accessed 15 September 2022]

¹⁸ Provided as Figure 6 in Rhondda Cynon Taf County Borough Council (2013) Local Flood Risk Management Strategy [Online] Available at:

<https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/LocalFloodRiskManagementStrategy.aspx> [Accessed 15 September 2022]

¹⁹ The Rhondda Cynon Taf County Borough Council (RCTCBC) Flood Risk Management Plan [Online] Available at: <https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/FloodRiskManagementPlanFinal.pdf> [Accessed 21 September 2022]

4.3 SuDS – Legislation and Guidance

Technical Advice Note 15 (TAN15)

- 4.3.1 Technical Advice Note 15: Development and Flood Risk (TAN15 – July 2004) provides a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location, can be assessed. It encourages the use of SuDS to manage surface water.

Floods and Water Management Act, 2010

- 4.3.2 Under the Floods and Water Management Act 2010, RCTCBC are designated as the LLFA and therefore are a statutory consultee on major planning applications in relation to surface water drainage.

Sustainable Drainage (SuDS) Statutory Guidance, Welsh Government

- 4.3.3 The SuDS Statutory Guidance establishes the requirements of Schedule 3 of the Flood and Water Management Act 2010; a framework for the approval and adoption of surface water management systems serving new developments. The SABs are assigned under the same Act, which give local authorities the responsibility to approve drainage systems for new developments. The overall objective of the legislation is to deliver effective, multi-purpose SuDS, which will remain effective for the lifetime of the development.

CIRIA SuDS Manual (C753)

- 4.3.4 The CIRIA SuDS (C753) is the most up-to-date industry standard containing revised principles and technical advice for the planning, design, construction, management and maintenance of effective SuDS. This document replaces the original CIRIA SuDS Manual (C697). As the LLFA, RCTCBC expect all new or existing developments be designed to align with the revised (C753) manual.

DEFRA Non-statutory technical standards for sustainable drainage systems, 2015

- 4.3.5 The Non-statutory technical standards for sustainable drainage systems is a national guidance document that provides a set of standards to be applied when designing SuDS systems for any development. Standards include controls on peak flow and volume of run-off and flood risk internal to the development and downstream. Standards S2, S4, S7, S8 and S9 state:
- S2 – for greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event;
 - S4 - where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event;
 - S7 – the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 30-year rainfall event;

- S8 - the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development; and
- S9 - The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.

LLFA and SAB Advice

- 4.3.6 Consultation with RCTCBC as the LLFA and SAB will be undertaken for the final ES to confirm the proposed Outline Drainage Strategy.

Compatibility of SuDS with Site conditions

- 4.3.7 The Proposed Development area is entirely greenfield, and existing greenfield rates of surface water runoff should be maintained in future via the provision of appropriate SuDS.

4.4 Proposed Outline Drainage Strategy for Wind Farm Development

Surface Water Discharge Hierarchy

- 4.4.1 In compliance with *Standard S1 (Surface water runoff destination) of the Statutory National Standards for SuDS for Wales* there must be sufficient evidence provided to prove that all surface water disposal routes have been explored to demonstrate that the surface water disposal hierarchy has been considered.
- 4.4.2 The disposal hierarchy is as follows:
1. Discharge by infiltration to the ground;
 2. Discharge to an open surface water body;
 3. Discharge to a surface water sewer; and
 4. Discharge to a combined or foul sewer.
- 4.4.3 It should be noted that a surface water connection to the combined or foul sewer can only be permitted under exceptional circumstances, if evidence shows that the previous site was connected to the same sewer and there are no other new feasible discharge options.

Discharge by Infiltration to the Ground

- 4.4.4 The ground conditions at the Wind Farm development area are considered likely for infiltration of runoff. The LANDIS soils database indicates that the majority of the Site is underlain by very acidic loamy upland soil with a wet peaty surface (described in **Section 2.1**). Further investigation of the viability of infiltration as a means by which surface water runoff could be discharged will be undertaken post- ES submission, through liaison with the SAB and by undertaking soakaway testing exercise.
- 4.4.5 Where there are pockets of peat present, it is recommended that the volume of water passing through areas is minimised by creating an outfall prior to reaching these areas or

by lining the open channels with an impermeable liner. This is to mitigate the risk of any local landslides, by minimising changes to the wetness of the peat as a result of the development.

Discharge to an Open Surface Water Body

- 4.4.6 A number of surface water bodies have been identified in the local area. These include the Nant Muchudd located south of the proposed wind farm as well as the Nant Gelliwion and Nant Castellau to the southeast of the site. The Rhondda River is approximately 1.2km to the north of the site.
- 4.4.7 There are a number of existing small water features around the Site, which include ponds and springs. From inspection of the Site boundary and the local topography, it is apparent that the majority of the proposed infrastructure on the Site can drain into the Nant Gelliwion and Nant Muchudd. The access track leading to turbine T02 is approximately 10 to 15m lower than the average point in the centre of the Site (i.e. between T03 and T04). As such, this section will need to drain into a tributary of the Rhondda River, if infiltration rates are unfavourable in this area.
- 4.4.8 The main site access track and the Grid Connection corridor are on land draining towards a tributary of Nant Muchudd. Runoff from new impermeable areas of the development will need to closely mimic these existing drainage regimes. A combination of infiltration and discharges to minor watercourses/new channels connecting with these watercourses is expected to form the drainage solution. Options for connecting to these surface water bodies will need to be investigated further post- ES submission when further is known about infiltration rates. However, it is anticipated that along with infiltration, discharge of flows to these waterbodies will be required.

Discharge to a Surface Water Sewer

- 4.4.9 There is unlikely to be any surface water sewer in the local area, therefore this option has not been taken further.

Discharge to a Combiner or Foul Sewer

- 4.4.10 There is unlikely to be any combined sewer in the local area, therefore this option has not been taken further.

Preferred Option for Discharge

- 4.4.11 It is anticipated that infiltration could be utilised for the disposal of surface water runoff, but at this stage it is assumed that it would need to be combined with a positive discharge into a watercourse. Any discharges to watercourses will be restricted to greenfield runoff rates.

Greenfield Runoff Rates

The undeveloped 'greenfield' runoff rate has been estimated using the ICP SuDS Method. The calculation is based upon the following factors:

- SAAR: Standard Average Annual Rainfall from the Flood Estimation Handbook website²⁰, which is 1,659mm for this location (approximate NGR: ST033893);

1. Centre for Ecology and Hydrology (2020), Flood Estimation Handbook Web Service. Available at: <https://fehweb.ceh.ac.uk/> [Checked 08/09/20]

- Soil: Soil index of the catchment from Flood Studies Report Figure I.4.18 or Wallingford Procedure Volume 3. Soil Types 1 to 5 have Soil Index Values of 0.15, 0.30, 0.40, 0.45 and 0.50 respectively. For the Wallingford maps, this Site was established to have a soil type 3, with a Soil Index Value of 0.40;
- Region Number: Region number of the catchment based on FSR Figure I.2.4, which is 9 for this Site; and
- FEH 2013 point data has been used to generate rainfall and greenfield contributions for the Site.

Using the ICP SUDS method Greenfield runoff rates have been calculated as shown in **Table 4.1** and the calculation to support the greenfield runoff are shown in **Annex C**.

Table 4.1 Existing Greenfield Runoff Rates

| Annual Exceedance Probability (AEP) (%) | Return Period (1 in.....) | Unit GF Runoff (l/s/ha) |
|---|---------------------------|-------------------------|
| 100 | 1 | 8.2 |
| 3.33 | 30 | 14.0 |
| 1 | 100 | 20.4 |
| Q _{BAR} | - | 9.3 |

The proposed SuDS solution

4.4.12 The indicative SuDS solution proposed for the construction and operational phases of the Wind Farm development is set out in **Table 4.2**. Runoff (and any limited groundwater from excavation areas) will be collected, attenuated, and treated in SuDS prior to discharge, by infiltration to the ground and into watercourses. SuDS will be designed to best practice as set out in the CIRIA SuDS Manual and Statutory National Standards for SuDS for Wales and the treatment requirements will follow Simple Index Approach. A water quality monitoring programme will be agreed with NRW and implemented prior, during and following construction.

Table 4.2 Indicative proposed SuDS Solution for Wind Farm development

| Proposed Development element | Indicative SuDS |
|------------------------------|--|
| Construction phase | |
| TCCs | Permeable surfacing with a minimum depth of 300mm uncompacted Type 3 stone (with a minimum porosity of 0.3) to be used across the entire compound (2,500m ²). If infiltration rates are favourable, then surface water will infiltrate at source. If an outlet is required, then a perforated pipe will collect water within the stone and direct it towards the nearest open channel, alongside the access track. |

2. Flood risk assessments: climate change allowances, Table 1 (<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>)

| Proposed Development element | Indicative SuDS |
|------------------------------|---|
| Operational phase | <p>Calculations using Micro Drainage 2018.1.1 demonstrate that when using a minimum infiltration rate of 1×10^{-5} m/s (conservative estimate from CIRIA typical infiltration rates (<i>The SuDS Manual C753 DEFRA 2015– Table 25.1</i>), this system can accommodate the 1 in 100 year plus 20% climate change without flooding. The results can be found in Annex C.</p> |
| Access tracks | <p>Open channels located on the downslope of the tracks to manage runoff from the tracks and where the land falls towards the tracks, a cut-off ditch is provided. Gradients will vary across the Proposed Development Site for the windfarm and therefore it will be necessary to use check dams within the open channels to attenuate flows and promote infiltration. Cross drains would be provided beneath the access tracks surface to convey overland runoff before being discharged into a nearby watercourse.</p> <p>Calculations using Micro Drainage 2018.1.1 demonstrate that a typical ditch section with a 300mm base width, 500mm deep, at a typical gradient ranging from 1:10 to 1:500 will accommodate the runoff from the access tracks for the 1 in 100 year plus 40% climate change without flooding; when using a minimum infiltration rate of 1×10^{-5} m/s (conservative estimate from CIRIA typical infiltration rates (<i>The SuDS Manual C753 DEFRA 2015– Table 25.1</i>) for the sides and base. The results can be found in Annex D.</p> <p>Where the existing ground becomes more level, the ditch sections can be locally widened to create additional online attenuation. Flow control will be managed with the use of the check dams.</p> |
| Substation | <p>It is anticipated that runoff from the roof will be collected into an underground water storage tank, which would then be recycled as greywater for re-use in the substation building. If infiltration rates are favourable, then any overflow will be directed towards a nearby infiltrate trench or soakaway. If rates do not allow sufficient infiltration to take place, then the connection can be to the nearest open channel alongside the access tracks.</p> <p>The internal track will be a permeable surface and the remaining areas will be topsoiled. If infiltration rates are favourable, then surface water will infiltrate at source. If an outlet is required, then a perforated pipe will collect water within the stone and direct it towards the nearest open channel, alongside the access track.</p> |
| Wind turbines and crane pads | <p>As the turbine pads and crane pads are buried after construction, the runoff from these areas will be the similar as the existing situation and therefore a drainage system is not required.</p> |

4.5 Proposed Outline Drainage Strategy for Grid Connection

- 4.5.1 The underground cables would be installed in an open cut trench (approximate depth of 0.9 to 1.0 below ground level, width between 300 to 600mm and a minimum cover depth to the top of the cable of 750mm). For further information refer to **Chapter 4: Description of the Proposed Development**. Excavation time will be kept to a minimum to minimise water ingress and dewatering requirements. If dewatering of the excavations is required appropriate treatment will be provided before discharge to surface or groundwater, and this could include the use of silt busters (or similar), if necessary. The potential for encountering groundwater during excavations is considered to be limited, and where

encountered, it is likely to be of low sensitivity, perched and in small quantities given the underlying geology (Coal Measures Formation comprising coal-bearing mudstones/siltstones with minor sandstones and ironstones).

- 4.5.2 During the operational phase, the underground cables would be entirely below ground and would not affect surface runoff rates. The impact arising from the presence of the OHL wooden poles on surface runoff rates is also scoped out

4.6 SuDS maintenance

- 4.6.1 Arrangements will be made for the adoption and future maintenance of the SuDS and drainage assets on the Proposed Development Site. An appropriate adopting body will be tasked with this. The exact body will need to be confirmed at the final detailed design stage to comply with then current guidance. Maintenance will be carried out in accordance with the methods and frequency specified in CIRIA's C753 SuDS Manual.

5. Flood Risk Mitigation

- 5.1.1 Based on the assessment undertaken in **Section 3**, the main flood mechanism at the Proposed Development was identified to be from surface water flooding (Wind Farm development and Grid Connection) and fluvial flooding (Grid Connection). Flood risk sources such as groundwater, sewer and artificial sources pose a limited risk to the Proposed Development.
- 5.1.2 This section outlines key flood risk management measures to ensure the Proposed Development is safe from flooding, and flood risk is not increased to off-site receptors.

Construction and operational phases

- 5.1.3 The initial flood risk management measures for the construction and operational phases of the Proposed Development are set out in **Table 5.1**. Those that relate to specific elements or phases will be identified in the wording of the measures, or will be identifiable by the matter being discussed (e.g. temporary measures will apply to the construction phase only).

Table 5.1 Proposed flood risk management measures for the Proposed Development

| Measure reference* | Development element | Flood risk management measure | Reason |
|--------------------|---|---|---|
| 1 | Working areas, internal access tracks, TCC, Grid Connection | <u>Water Management Plan</u> Implementation of an appropriate Water Management Plan (WMP) for the construction phase of the Wind Farm Development and Grid Connection, utilising SuDS principles, including collection, conveyance and attenuation/infiltration storage. Suitable temporary silt fencing, bunding and water quality measures (i.e. silt capture to maintain storage volume) will be included in the design of these works. Sufficient capacity will be provided onsite to hold runoff prior to discharge runoff to ground and/or any water discharge into watercourses is limited to greenfield rates. This would be secured through a planning consent requirement, likely via the CEMP. | To ensure no increase in flood risk downstream of the Proposed Development. |
| 2 | Wind Farm Development | <u>Detailed drainage design</u> Detailed drainage design for the operational Wind Farm development, utilising SuDS principles, including attenuation storage where necessary, to ensure sufficient capacity is available onsite to discharge runoff to ground and/or any water discharge into watercourses is limited to greenfield rates. This would be secured through a planning consent requirement. The detailed design will | To ensure no increase in flood risk downstream of the Proposed Development. |

| Measure reference* | Development element | Flood risk management measure | Reason |
|--------------------|---|--|---|
| | | be prepared in accordance with the Drainage Strategy for the operational Wind Farm development, which will accompany the final ES. | |
| 3 | Working areas, internal access tracks, TCC, Wind Farm Development | <p><u>Discharges of surface water runoff</u> Further investigation of the viability of infiltration as a means by which surface water runoff could be discharged to ground will be undertaken post- ES, through liaison with RCTCBC and by undertaking a soakaway testing exercise. In the case that the soakaway testing concludes that infiltration is not solely sufficient in managing runoff, and discharge to the watercourses is required, this will be subject to a Consent from the NRW and RCTCBC and dewatering would be suspended if a flood alert or flood warning is in place downstream (and the on-site discharges could feasibly contribute to the flood event). Any discharge to surface water would be restricted to the greenfield runoff rate.</p> | To ensure no increase in flood risk downstream of the Proposed Development. |
| 4 | Working areas | <p><u>Discharge of pumped groundwater</u> Any groundwater dewatered from excavations (e.g. excavations associated with turbine foundation, OHL wooden poles and underground cables) will be discharged to adjacent ground, away from watercourses as far as possible. If infiltration is not possible, and discharge to the watercourses is required, this will be subject to a Consent from the NRW and RCTCBC and dewatering would be suspended if a flood alert or flood warning is in place downstream (and the on-site discharges could feasibly contribute to the flood event).</p> | To manage groundwater flood risk and to ensure that any negative impacts on flooding downstream is limited as far as possible. To ensure there is any change in flood risk due to water discharges is limited as far as possible. |
| 5 | Working areas | <p><u>Standoff distance</u> No works will be undertaken within 3 m of any watercourse (other than for watercourse crossings and drainage mitigation). Any works within 8 m of non-tidal Main River will be subject to a Flood Risk Activity Permit (FRAP) from NRW. Any works within 8 m of an Ordinary Watercourse will be subject to a Land Drainage Consent from RCTCBC.</p> | This measure will minimise any potential impacts to flow conveyance in the watercourse, particularly during high flow or flood events. |
| 6 | Internal access tracks | <p><u>Crossing of surface water flow paths</u> Where the proposed access tracks cross mapped surface water flow paths, a pipe culvert will be provided beneath the access track to convey flows from existing drainage pathways. The design of the pipe culvert will</p> | To convey flows from the mapped surface water flow path beneath the crossing, preventing flooding of the access track. |

| Measure reference* | Development element | Flood risk management measure | Reason |
|--------------------|---|---|---|
| | | <p>be confirmed as part of the detailed drainage design with the LLFA.</p> <p>Where the proposed underground cable crosses mapped surface water flow paths, each crossing will be individually reviewed / surveyed during detailed design (which will occur subsequent to gaining planning consent) to confirm the crossing methodology employed. It is anticipated that open cut crossing methodology will predominantly be used.</p> <p>Crossings will be subject to a Land Drainage Consent from RCTCBC.</p> | Maintain existing conveyance capacity of surface water flow path. |
| 7 | Working areas - temporary access crossings | <p><u>Temporary watercourse crossings</u></p> <p>If temporary watercourse crossings are required to enable access over any watercourses, these would be appropriately sized to maintain existing flow conveyance.</p> | Maintain existing conveyance capacity of watercourses |
| 8 | Electrical connection and Grid Connection | <p><u>Underground cables</u></p> <p>The underground cables linking the turbines to the substation and the underground section cables connecting the substation to the WPD connection point at Upper Boat will be constructed in discrete sections with the reinstatement process commenced in as short a timeframe as practicable.</p> | Minimise changes in watercourse flow conveyance |
| 9 | Working areas | <p><u>Topsoil stockpiles</u></p> <p>Stockpiles will be appropriately maintained and have the minimum lifespan possible, with materials being reinstated as construction works progress. Where these remain in situ for 3 months or longer, seeding management techniques will be used. Stockpiles will be stored exclusively within areas of very low flood risk (Flood Zone A in the DAM or Flood Zone 1 in the FMfP).</p> | To prevent sedimentation of watercourses and waterbodies (and thus reduction in watercourse flow capacities). To prevent loss of topsoil in a major flood event, thereby reducing the availability of material for reinstatement. |
| 10 | Access routes and working areas | <p><u>Temporary components</u></p> <p>Once construction is complete, any temporary components (such as working areas) will be removed, and the ground reinstated to preconstruction conditions. Any excavations will be backfilled using soil stockpile materials, slightly above natural ground level to allow for settlement.</p> | To ensure that rainfall infiltration and runoff generation characteristics are returned to preconstruction conditions. |
| 11 | Areas located in, or requiring access, via the floodplain during construction | <p><u>Emergency Flood Response Plan</u></p> <p>An Emergency Flood Response Plan would be prepared and implemented for the construction phase, including safe access and egress routes where required. The Preparation of an Emergency Flood Response Plan is secured via the CEMP.</p> | To address the risk of flooding from both fluvial and artificial sources during construction phase. For the safety of site operatives who may be working within the floodplain, or may need to |

| Measure reference* | Development element | Flood risk management measure | Reason |
|--------------------|---|-------------------------------|--|
| | of the Grid Connection by the WPD connection point. | | cross it to access/egress the part of the Proposed Development boundary they are working in. |

Decommissioning phase

- 5.1.4 Relevant flood mitigation measures will be developed once the required works and activities associated with the decommissioning of the Proposed Development are confirmed. It is likely that they will include similar measures as listed above for the construction and operational phases. Specification of such measures must take account of the changes in the flood hazard baseline relating to climate change, change of land-use and regulatory requirements prevailing at the time.

6. Conclusions

- 6.1.1 This Draft FCA accompanies the Draft ES for the Proposed Development and has been prepared in accordance with the Technical Advice Note 15: Development and Flood Risk (TAN15). The findings of this FCA are summarised below:
- flood risk to the Proposed Development has been assessed from all potential sources, and the key flood risk to the development is from surface water (Wind Farm development and Grid Connection) and fluvial and artificial sources (Grid Connection, short section of underground cable near WPD connection point). The Proposed Development is considered to be at low risk of flooding from groundwater and sewer sources;
 - the Proposed Development lies almost entirely within an area of very low risk of fluvial flooding. A small section of the Grid Connection (underground cable) near the WPD connection point is situated within a region of Flood Zones B and C1 associated with the Nant Taf. In accordance with TAN15 guidance, a Justification Test is required for this element of the development. The proposed Grid Connection route is based on a review of technical factors and proximity to a WPD connection point. In addition, the risk of flooding to the underground cable during construction works can be managed with appropriate mitigation measures, as outlined in Section 5. Therefore, the Justification Test is considered to be passed;
 - most of the Site is at very low risk of flooding from surface water flooding, owing to its location on a summit with minimal upstream catchment. There are small areas of high surface water flood risk associated with existing ponds and depressions, and the headwaters of several ordinary watercourses that intersect the Proposed Development. Potential mitigation to assist in conveying flows (consistent with the existing flow pathways) is proposed. This indicates that, for the most part, it will be surface water runoff originating from the Proposed Development which will be the primary surface water flood risk consideration;
 - runoff from the Proposed Development will be managed to ensure no increase in flood risk downstream of the Proposed Development. A WMP for the construction phase and Detailed Drainage Design would be secured through a planning consent requirement;
 - for the Draft FCA, an outline approach to drainage has been identified, including identification of the discharge locations (discharge to ground and if required supplemented by discharge to watercourses), discharge rates (greenfield Q_{BAR}) and SuDS attenuation volumes (up to and including the 1% AEP plus 20% and 40% climate change events for the construction and operational phases respectively); and
 - investigation of the viability of infiltration as a means by which surface water runoff could be discharged will be undertaken post-Draft ES, through liaison with RCTCBC and by undertaking soakaway testing. In the case that the soakaway testing concludes that infiltration is not solely sufficient in managing runoff, and discharge to the watercourses is required, this will be subject to a Consent from the NRW and RCTCBC.
- 6.1.2 The Draft FCA concludes that the Proposed Development, together with the proposed flood risk management measures above, would not be subject to an unacceptable level of risk, nor would there be potential increased flood risk elsewhere. As such the development is acceptable on flood risk grounds and meets the aims of TAN15.

Annex A

Correspondence and data provided by RCTCBC

From: [REDACTED]
Sent: 11 August 2022 12:57
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Data Request Mynydd y Glyn

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi

Thank you for your email enquiry with respect to the identification of known Private Water Supplies in proximity to a specific geospatial object(s). This response is specifically in relation to the aspect of your enquiry concerning "Private (unlicensed) surface water and groundwater abstractions", other aspects of your enquiry have been forwarded to the relevant Local Authority Department for their specific response in due course.

The Local Authority has searched its records of Private Water Supplies that are known to the Local Authority and can confirm that **the following known Private Water Supply is believed to be within the 4km radial search area of the centroid coordinates provided** in respect of proposed Mynydd y Glyn Windfarm: -

| PWS Record | RCT GIS ID | RCT Flare Pin | PWS Source Type (DWI) | PWS User XY Redacted | PWS User Address Redacted |
|------------|------------|---------------|-----------------------|-----------------------|--|
| Source | 22A | 200271 | BHW | POINT (304800 193400) | ROCK TERRACE, YNYSYBWL, PONTYPRIDD, CF37 3 |
| Source | 55 | 200162 | SPW | POINT (304000 188000) | RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, CF37 3 |
| Source | 66 | 200175 | SPW | POINT (305000 191500) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| Source | 68 | 200078 | SPW | POINT (306700 187100) | , BLACK ROAD, PEN-Y-COEDCAE, PONTYPRIDD, CF37 3 |
| Source | 105 | 200039 | SPW | POINT (304400 188600) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, CF37 3 |
| Source | 135 | 199764 | MMS | POINT (304500 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 3 |
| Source | 141 | 199769 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 3 |
| Source | 249A | 7679 | SPW | POINT (304800 187600) | , ROAD TO CASTELLAU FAWR FARM, CASTELLAU, BEDDAU, CF37 3 |
| User | 51 | 199771 | SPW | POINT (303300 187600) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, CF37 3 |
| User | 52 | 235877 | SPW | POINT (303400 187600) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, CF37 3 |
| User | 53 | 200268 | SPW | POINT (303700 187500) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, CF37 3 |
| User | 54 | 199370 | SPW | POINT (303700 187500) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, CF37 3 |
| User | 56 | 200163 | SPW | POINT (304000 188000) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, CF37 3 |
| User | 60 | 200176 | SPW | POINT (304400 191500) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 61 | 200181 | SPW | POINT (304400 191500) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 62 | 200180 | SPW | POINT (304400 191300) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 63 | 200178 | SPW | POINT (304500 191300) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 64 | 200179 | SPW | POINT (304500 191300) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 65 | 6973 | SPW | POINT (304900 191500) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 67 | 200177 | SPW | POINT (305000 191500) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 3 |
| User | 69 | 200077 | SPW | POINT (306700 187100) | , BLACK ROAD, PEN-Y-COEDCAE, PONTYPRIDD, CF37 3 |
| User | 70 | 200076 | SPW | POINT (306800 187100) | , BLACK ROAD, PEN-Y-COEDCAE, PONTYPRIDD, CF37 3 |
| User | 77 | 200170 | SPW | POINT (300200 190000) | , PLEASANT VIEW, PENRHIW-FER, TONYPANDY, CF37 3 |

| | | | | | |
|------|-----|--------|-----|-----------------------|---|
| User | 79 | 200169 | SPW | POINT (300200 189900) | , PLEASANT VIEW, PENRHIW-FER, TONYPANDY, CF |
| User | 106 | 200038 | SPW | POINT (304400 188600) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, P |
| User | 125 | 200060 | MMS | POINT (304200 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 134 | 199361 | MMS | POINT (304400 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 136 | 199360 | MMS | POINT (304500 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 137 | 199362 | MMS | POINT (304500 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 142 | 199366 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 143 | 199367 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 144 | 199368 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 198 | 7455 | UNK | POINT (300800 188700) | , GILFACH ROAD, TONYREFAIL, PORTH, CF39 8HL |
| User | 202 | 200036 | UNK | POINT (301200 187400) | , MILL STREET, TONYREFAIL, PORTH, CF39 8LJ |
| User | 204 | 7737 | UNK | POINT (301600 187000) | , CELYN ISAF, TONYREFAIL, PORTH, CF39 8LJ |
| User | 209 | 200091 | UNK | POINT (301800 192100) | , TROEDYRHIW ROAD, PORTH, CF39 0DP |
| User | 216 | 200145 | UNK | POINT (302100 193000) | , GRAIG ROAD, YNYSHIR, PORTH, CF39 0AH |
| User | 217 | 200028 | UNK | POINT (302400 186000) | , ROAD TO GARTH HALL FARM, COEDEL, TONYRE |
| User | 219 | 7431 | UNK | POINT (302400 188900) | , LLANTRISANT ROAD, TONYREFAIL, PORTH, CF39 8 |
| User | 220 | 199339 | UNK | POINT (302500 188300) | , PANTYBRAD, TONYREFAIL, PORTH, CF39 8PP |
| User | 221 | 8134 | UNK | POINT (302600 189500) | , RHIWGARN ROAD, TREBANOG, PORTH, CF39 8AX |
| User | 222 | 6898 | UNK | POINT (302600 185700) | , ROAD TO GARTH HALL FARM, COEDEL, TONYRE |
| User | 228 | 7689 | UNK | POINT (303400 186900) | , LLANTRISANT ROAD, CASTELLAU, BEDDAU, PONT |
| User | 231 | 128726 | UNK | POINT (304000 186800) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU |
| User | 232 | 71151 | UNK | POINT (304000 186800) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU |
| User | 233 | 8026 | UNK | POINT (304100 186700) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU |
| User | 234 | 7730 | UNK | POINT (304200 186700) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU |
| User | 235 | 199774 | UNK | POINT (304300 187200) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU |
| User | 239 | 200167 | UNK | POINT (304500 186200) | , HEOL DDU, CASTELLAU, BEDDAU, PONTYCLUN, C |
| User | 243 | 6933 | UNK | POINT (304700 187500) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU |
| User | 244 | 199353 | UNK | POINT (304700 188800) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, P |
| User | 246 | 146051 | UNK | POINT (304800 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF |
| User | 247 | 6915 | UNK | POINT (304800 186100) | , HEOL DDU, CASTELLAU, BEDDAU, PONTYCLUN, C |
| User | 249 | 7679 | SPW | POINT (304800 187600) | , ROAD TO CASTELLAU FAWR FARM, CASTELLAU, E |
| User | 255 | 200042 | UNK | POINT (305500 187900) | , TONYREFAIL ROAD, PEN-Y-COEDCAE, PONTYPRID |
| User | 256 | 200270 | UNK | POINT (305500 187900) | , TONYREFAIL ROAD, PEN-Y-COEDCAE, PONTYPRID |
| User | 261 | 6903 | UNK | POINT (305800 191600) | , GRAIGWEN ROAD, PONTYPRIDD, CF37 3NW |
| User | 264 | 160667 | UNK | POINT (305900 192300) | , PEN-Y-WAL ROAD, GRAIGWEN, PONTYPRIDD, CF3 |
| User | 265 | 7680 | UNK | POINT (305900 192300) | , PEN-Y-WAL ROAD, GRAIGWEN, PONTYPRIDD, CF3 |
| User | 267 | 7435 | UNK | POINT (306300 191100) | , PEN-Y-WAL ROAD TO LAN QUARRY, GRAIGWEN, P |
| User | 268 | 7999 | UNK | POINT (306300 188900) | , PENRHIW ROAD, GRAIG, PONTYPRIDD, CF37 1PF |

Having regard to nature of the information, the UK General Data Protection Regulations and Data Protection Act 2018, Environmental Information Regulations (Regulations 12 & 13) and relevant ICO guidance documents the geospatial information provided has been partially redacted to an associated 100m² area. If you wish to discuss this aspect of the response further please contact.

Be aware that it may be inappropriate to undertake land treatment or disturbance in the vicinity of the identified private water supply if such an activity could adversely affect the quality or wholesomeness of the private water supply.]

Please note that the Local Authority records are limited to what is recorded on the Local Authority Private Water Supply register at the time of the search. Private Water Supplies (both their sources and users) may exist that are not known to the Local Authority or otherwise are not included within its records. In addition some Private Water Supplies may make use or may be influenced by surface water features, that may extend over a considerable distance, which are not included within the record. Also new Private Water Supplies may come into use subsequent to this response to your enquiry. The Local Authority's Private Water Supplies register only includes information pertinent to the Private Water Supplies (Wales) Regulations 2017 and does not consider non-Private Water Supplies usage (i.e. waters used only for recreational bathing, etc). As such, best practice should be followed in respect of any proposed land treatment or disturbance and if there is doubt or a possibility that a Private Water Supply (known or otherwise) could be influenced then the precautionary principle should be observed.

If you wish to discuss this matter further please contact

Yours

[Redacted signature area]

From: [Redacted]
Sent: 11 August 2022 10:41
To: [Redacted]
Cc: [Redacted]
Subject: RE: Data Request Mynydd y Glyn

Hi [Redacted]

Thank you for your detailed response and apologies for not being clear on the 4 km search area. Please use **National Grid Reference ST 03626 89459** as the centroid for the 4 km search for private (unlicensed) surface water and groundwater abstractions.

Kind regards,
[Redacted signature area]



From: [REDACTED]
Sent: 11 August 2022 09:46
To: [REDACTED] >
Cc: [REDACTED]
Subject: RE: Data Request Mynydd y Glyn

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi

Thank you for your email enquiry with respect to the identification of known Private Water Supplies in proximity to a specific geospatial object(s). This response is specifically in relation to the aspect of your enquiry concerning “Private (unlicensed) surface water and groundwater abstractions”, other aspects of your enquiry have been forwarded to the relevant Local Authority Department for their specific response in due course.

The following search has been undertaken in respect of the polygon within the ESRI shape file provided, if you require said information to be provided within 4km of the site you should either provide the coordinates of a centroid of the desired search area to enable a simple radial search to be performed or provide a suitable ESRI shapefile of the desired search area (using a CRS projection EPSG:27700 - OSGB36 / British National Grid and including the relevant search area as a polygon(s)) or provide a detailed suitably scaled map of the desired search area which can be transcribed (the transcription of mapped boundaries may incur a cost which may have to be paid in advance of the enquiry being answered).

The Local Authority has searched its records of Private Water Supplies that are known to the Local Authority and can confirm that **the following known Private Water Supply is believed to be within the search area provided** in respect of proposed Mynydd y Glyn Windfarm: -

| PWS Record | RCT Flare Pin | PWS Source Type (DWI) | PWS User XY Redacted | PWS User Address Redacted |
|------------|---------------|-----------------------|-----------------------|---|
| Source | 200162 | SPW | POINT (304000 188000) | RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| Source | 199764 | MMS | POINT (304500 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU; |
| Source | 199769 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU; |
| Source | 7679 | SPW | POINT (304800 187600) | , ROAD TO CASTELLAU FAWR FARM, CASTELLAU, BEDDAU, PONTYCLUN, |
| User | 199771 | SPW | POINT (303300 187600) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 235877 | SPW | POINT (303400 187600) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 200268 | SPW | POINT (303700 187500) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 199370 | SPW | POINT (303700 187500) | , RACKETT COTTAGES ROAD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 200163 | SPW | POINT (304000 188000) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 200178 | SPW | POINT (304500 191300) | , HAFOD LANE, PANTYGRAIG-WEN, PONTYPRIDD, CF37 2PF |
| User | 200170 | SPW | POINT (300200 190000) | , PLEASANT VIEW, PENRHIW-FER, TONYPANDY, CF40 1SE |
| User | 200169 | SPW | POINT (300200 189900) | , PLEASANT VIEW, PENRHIW-FER, TONYPANDY, CF40 1SE |
| User | 200038 | SPW | POINT (304400 188600) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 200060 | MMS | POINT (304200 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |

| | | | | |
|------|--------|-----|-----------------------|---|
| User | 199361 | MMS | POINT (304400 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 199360 | MMS | POINT (304500 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 199362 | MMS | POINT (304500 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 199366 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 199367 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 199368 | SFW | POINT (304600 190600) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 7455 | UNK | POINT (300800 188700) | , GILFACH ROAD, TONYREFAIL, PORTH, CF39 8HL |
| User | 7431 | UNK | POINT (302400 188900) | , LLANTRISANT ROAD, TONYREFAIL, PORTH, CF39 8YY |
| User | 199339 | UNK | POINT (302500 188300) | , PANTYBRAD, TONYREFAIL, PORTH, CF39 8PP |
| User | 8134 | UNK | POINT (302600 189500) | , RHIWGARN ROAD, TREBANOG, PORTH, CF39 8AX |
| User | 199774 | UNK | POINT (304300 187200) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 6933 | UNK | POINT (304700 187500) | , ROAD TO CROFT YR HAIDD, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 199353 | UNK | POINT (304700 188800) | , ROAD TO BWLCH GWYN, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 146051 | UNK | POINT (304800 190700) | , MOUNT PLEASANT, TREHAFOD, PONTYPRIDD, CF37 2NU |
| User | 7679 | SPW | POINT (304800 187600) | , ROAD TO CASTELLAU FAWR FARM, CASTELLAU, BEDDAU, PONTYCLUN, CF72 8LQ |
| User | 200042 | UNK | POINT (305500 187900) | , TONYREFAIL ROAD, PEN-Y-COEDCAE, PONTYPRIDD, CF37 1QA |
| User | 200270 | UNK | POINT (305500 187900) | , TONYREFAIL ROAD, PEN-Y-COEDCAE, PONTYPRIDD, CF37 1QA |

Having regard to nature of the information, the UK General Data Protection Regulations and Data Protection Act 2018, Environmental Information Regulations (Regulations 12 & 13) and relevant ICO guidance documents the geospatial information provided has been partially redacted to an associated 100m² area. If you wish to discuss this aspect of the response further please contact.

Be aware that it may be inappropriate to undertake land treatment or disturbance in the vicinity of the identified private water supply if such an activity could adversely affect the quality or wholesomeness of the private water supply.]

Please note that the Local Authority records are limited to what is recorded on the Local Authority Private Water Supply register at the time of the search. Private Water Supplies (both their sources and users) may exist that are not known to the Local Authority or otherwise are not included within its records. In addition some Private Water Supplies may make use or may be influenced by surface water features, that may extend over a considerable distance, which are not included within the record. Also new Private Water Supplies may come into use subsequent to this response to your enquiry. The Local Authority's Private Water Supplies register only includes information pertinent to the Private Water Supplies (Wales) Regulations 2017 and does not consider non-Private Water Supplies usage (i.e. waters used only for recreational bathing, etc). As such, best practice should be followed in respect of any proposed land treatment or disturbance and if there is doubt or a possibility that a Private Water Supply (known or otherwise) could be influenced then the precautionary principle should be observed.

If you wish to discuss this matter further please contact

Yours



[REDACTED] | [REDACTED]

From: [REDACTED] >

Sent: 09 August 2022 15:20

To: [REDACTED]

Cc: [REDACTED]

Subject: Data Request Mynydd y Glyn

Mimecast Attachment Protection has deemed this file to be safe, but always exercise caution when opening files.

Dear Sir / Madam,

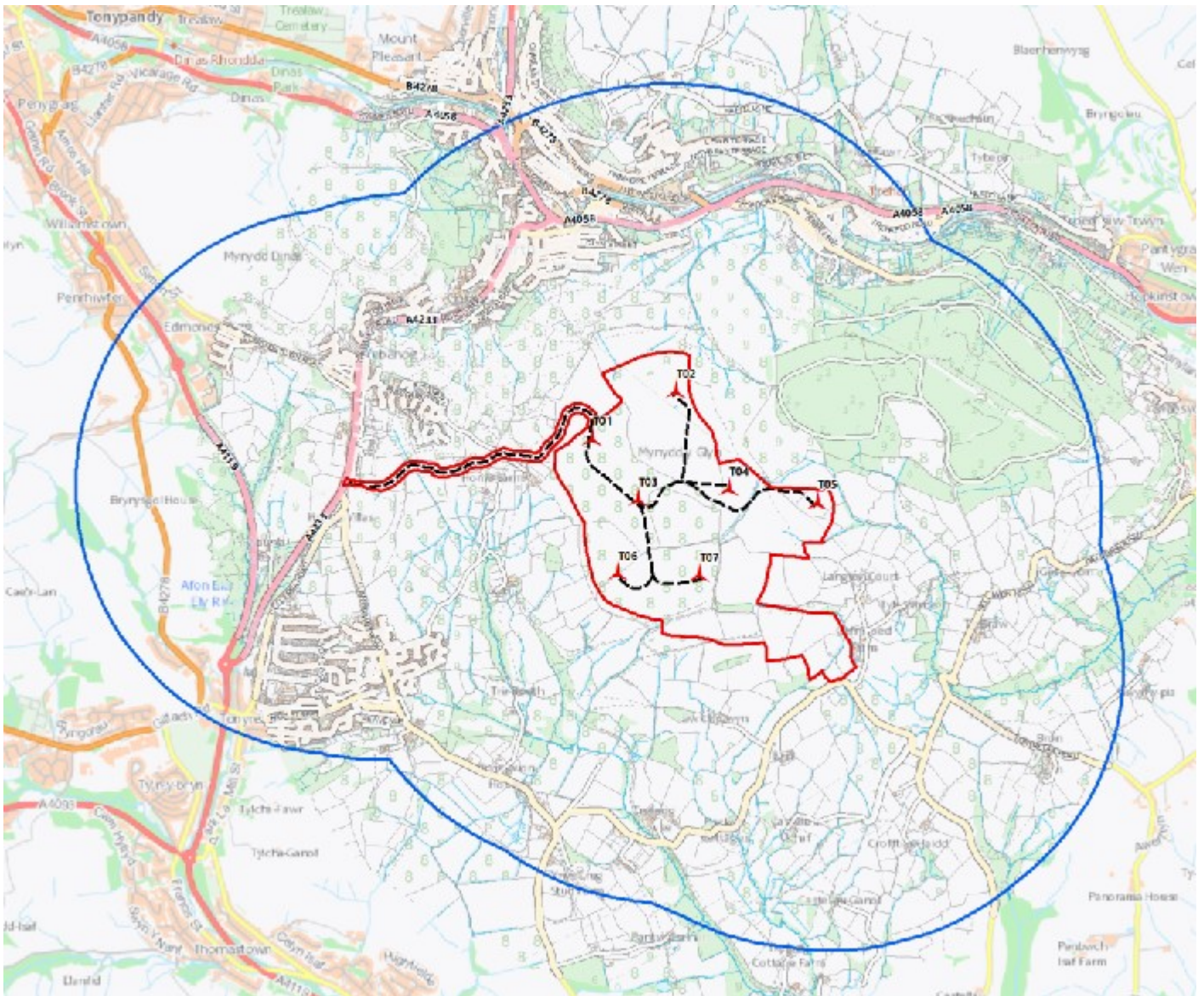
As part of Environmental Impact Assessment and Flood Risk work which Wood Environment & Infrastructure Solutions UK Limited is undertaking for the planning application for Mynydd y Glyn Wind Farm approximately 600m from the southeastern edge of the village of Pant (National Grid Reference ST 03626 89459), I would like to make the information requests below. The planning application boundary (red line) is shown on the attached PDF plan, and wider study area (1.5km buffer) shapefile is included for reference and a screenshot is shown below. The proposed development includes seven wind turbines, substation, temporary construction compound, crane pads and cabling, access tracks and grid connection (overhead line and underground cable). Please note that the current proposed layout may be subject to change following further surveys and consultation.

- Records of local historical flooding;
- Any local surface water flood risk issues;
- Specific supplementary guidance on drainage policy including greenfield runoff and SuDS requirements. Could you please specify the requirements of an outline drainage strategy, allowable discharge rates and climate change allowances expected;
- Private (unlicensed) surface water and groundwater abstractions within 4km of the site (NGR, source, holder, purpose). (I have contacted Natural Resources Wales with regards to licensed water abstraction) - excel format.

Please do not hesitate to contact me ([REDACTED]) if you have any specific queries about this request.

Kind regards,

[REDACTED]



Croesawn ohebu yn Gymraeg a fydd gohebu yn y Gymraeg ddim yn arwain at oedi. Rhowch wybod inni beth yw'ch dewis iaith e.e. Cymraeg neu'n ddwyieithog

Mae'r neges ar gyfer y person / pobl enwedig yn unig. Gall gynnwys gwybodaeth bersonol, sensitif neu gyfrinachol. Os nad chi yw'r person a enwyd (neu os nad oes gyda chi'r awdurdod i'w derbyn ar ran y person a enwyd) chewch chi ddim ei chopio neu'i defnyddio, neu'i datgelu i berson arall. Os ydych chi wedi derbyn y neges ar gam, rhowch wybod i'r sawl sy wedi anfon y neges ar unwaith. Mae'n bosibl y bydd holl negeseuon yn cael eu cofnodi a/neu fonitro unol â'r ddeddfwriaeth berthnasol. I ddarllen yr ymwadiad llawn, ewch i <http://www.rctcbc.gov.uk/ymwadiad>

We welcome correspondence in Welsh and corresponding with us in Welsh will not lead to a delay. Let us know your language choice if Welsh or bilingual

This transmission is intended for the named addressee(s) only and may contain personal, sensitive or confidential material and should be handled accordingly. Unless you are the named addressee (or authorised to receive it for the addressee) you may not copy or use it, or disclose it to anyone else. If you have received this transmission in error please notify the sender immediately. All traffic may be subject to recording and/or monitoring in accordance with relevant legislation For the full disclaimer please access <http://www.rctcbc.gov.uk/disclaimer>

Croesawn ohebu yn Gymraeg a fydd gohebu yn y Gymraeg ddim yn arwain at oedi. Rhowch wybod inni beth yw'ch dewis iaith e.e. Cymraeg neu'n ddwyieithog

Mae'r neges ar gyfer y person / pobl enwedig yn unig. Gall gynnwys gwybodaeth bersonol, sensitif neu gyfrinachol. Os nad chi yw'r person a enwyd (neu os nad oes gyda chi'r awdurdod i'w derbyn ar ran y person a enwyd) chewch chi ddim ei chopio neu'i defnyddio, neu'i datgelu i berson arall. Os ydych chi wedi derbyn y neges ar gam, rhowch wybod i'r sawl sy wedi anfon y neges ar unwaith. Mae'n bosibl y bydd holl negeseuon yn cael eu cofnodi a/neu fonitro unol â'r ddeddfwriaeth berthnasol. I ddarllen yr ymwadiad llawn, ewch i <http://www.rctcbc.gov.uk/ymwadiad>

We welcome correspondence in Welsh and corresponding with us in Welsh will not lead to a delay. Let us know your language choice if Welsh or bilingual

This transmission is intended for the named addressee(s) only and may contain personal, sensitive or confidential material and should be handled accordingly. Unless you are the named addressee (or authorised to receive it for the addressee) you may not copy or use it, or disclose it to anyone else. If you have received this transmission in error please notify the sender immediately. All traffic may be subject to recording and/or monitoring in accordance with relevant legislation For the full disclaimer please access <http://www.rctcbc.gov.uk/disclaimer>

Annex B

Correspondence and data provided by NRW

From: [REDACTED]
Sent: 28 September 2022 16:25
To: [REDACTED]
Subject: ATI-23795a - Data Request Mynydd y Glyn

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi [REDACTED]
Please find the links to the model reports and outputs below. For security, these links will expire in 30 days.

V5.0 - Rhondda

Model Report

<https://cyfoethnaturiolcymru.sharefile.eu/d-s940a7695aca4467d9800ebab6bf3421e>

Model Outputs

<https://cyfoethnaturiolcymru.sharefile.eu/d-scb6892119bd24f3e9f1c92c8d293b81e>

V5.1 – Rhondda

Model Report

<https://cyfoethnaturiolcymru.sharefile.eu/d-s3b610ab8287d4bffbe6e000a04bb0fa3>

Model Outputs

<https://cyfoethnaturiolcymru.sharefile.eu/d-s41d3cf0022d6465480f390ad7670a577>

V5.2 – Rhondda

Model Report

<https://cyfoethnaturiolcymru.sharefile.eu/d-s015fbea14fa74a069c92cb90a023d849>

Model Outputs

<https://cyfoethnaturiolcymru.sharefile.eu/d-s312e08da302446df8a3bebcfaf483d0d8>

Lower Taff – 2022

Model Report

<https://cyfoethnaturiolcymru.sharefile.eu/d-s8cbe7cbb750e4fa49d79a84918d9cac3>

Model Outputs

<https://cyfoethnaturiolcymru.sharefile.eu/d-s4532bcacd1a74de0acd3539b85ebe2e5>

ElyAndClun – 2011

Model Report

<https://cyfoethnaturiolcymru.sharefile.eu/d-s55cb2406ecba40c8b92d1b78e763ae0f>

Model Outputs

<https://cyfoethnaturiolcymru.sharefile.eu/d-s5e791092ebda4af0a3f553ab6609f084>

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The following attribution statement should be included if re-using this data – “Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

Thanks,

[Redacted signature block]

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

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

From: [Redacted]

Sent: 28 September 2022 11:36

To: [Redacted]

Cc: [Redacted]

Subject: RE: ATI-23795a - Data Request Mynydd y Glyn

Hi [Redacted]

Thanks for your response. I need all of the Flood Modelling Product associated with watercourses that are within the study area (see map below). I have attached a shapefile of the 1.5 km study area for reference. The approximate centre of the site is as provided previously (NGR ST 03626 89459)- This is in the Afon Rhondda Fawr (confluence with Afon Rhondda Fach to confluence with Afon Taf) WFD Surface Water Body.

The study area is within the following three WFD surface water bodies:

- Nant Muchudd (source to confluence with Afon Elai) Surface Water Body
- Afon Rhondda Fawr (confluence with Afon Rhondda Fach to confluence with Afon Taf) Surface Water Body
- Afon Elai (source to confluence with Nant Clun) Surface Water Body

As such I would like Flood modelling products 5 and 6 associated with the Afon Rhondda Fawr, Afon Taf and Afon Elai and tributaries within the area of interest

I hope this provides some clarification. Please let me know if you have any further queries.

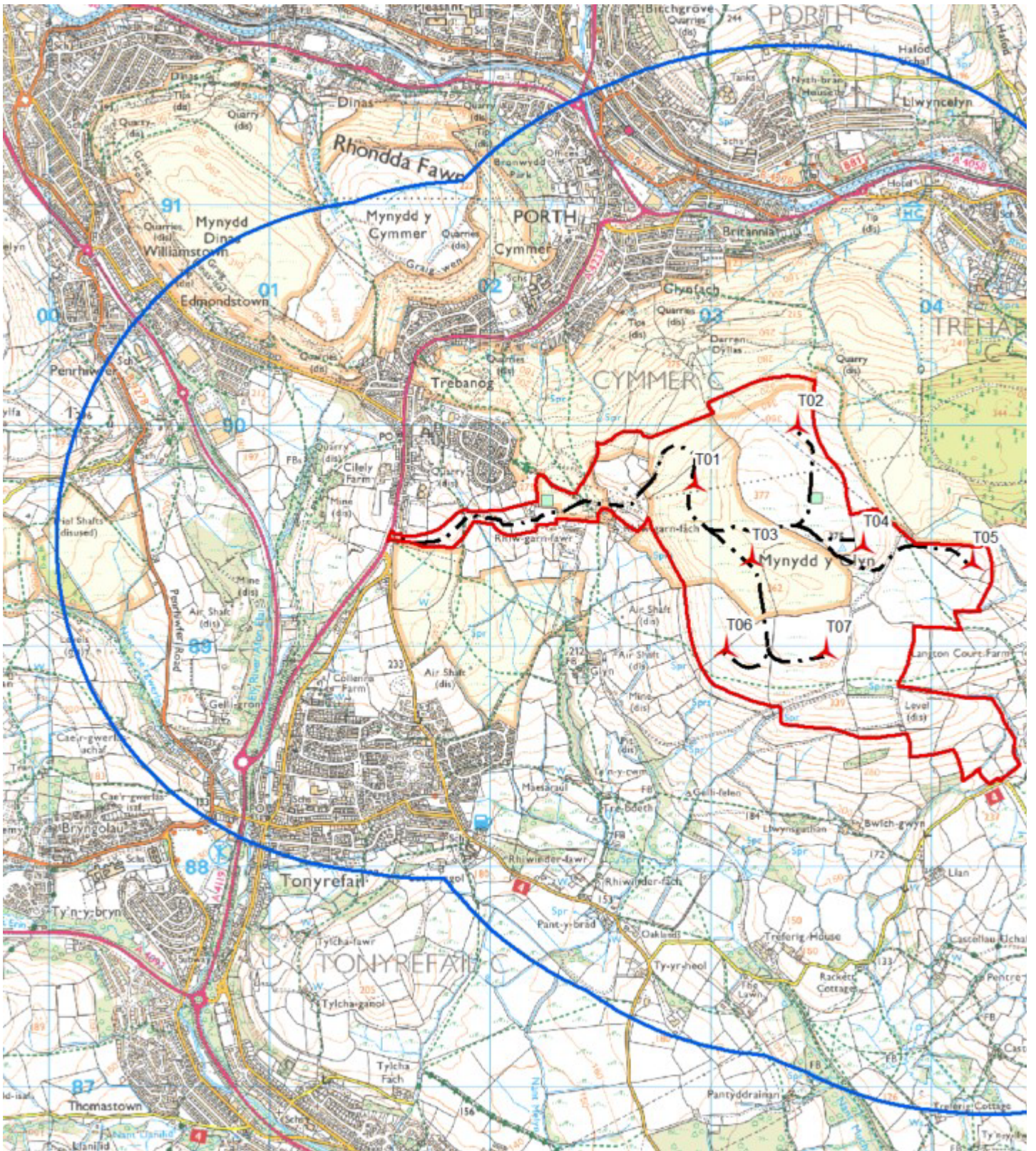
Could you also give me an idea of when this data is likely to be sent through, as it is needed very urgently.

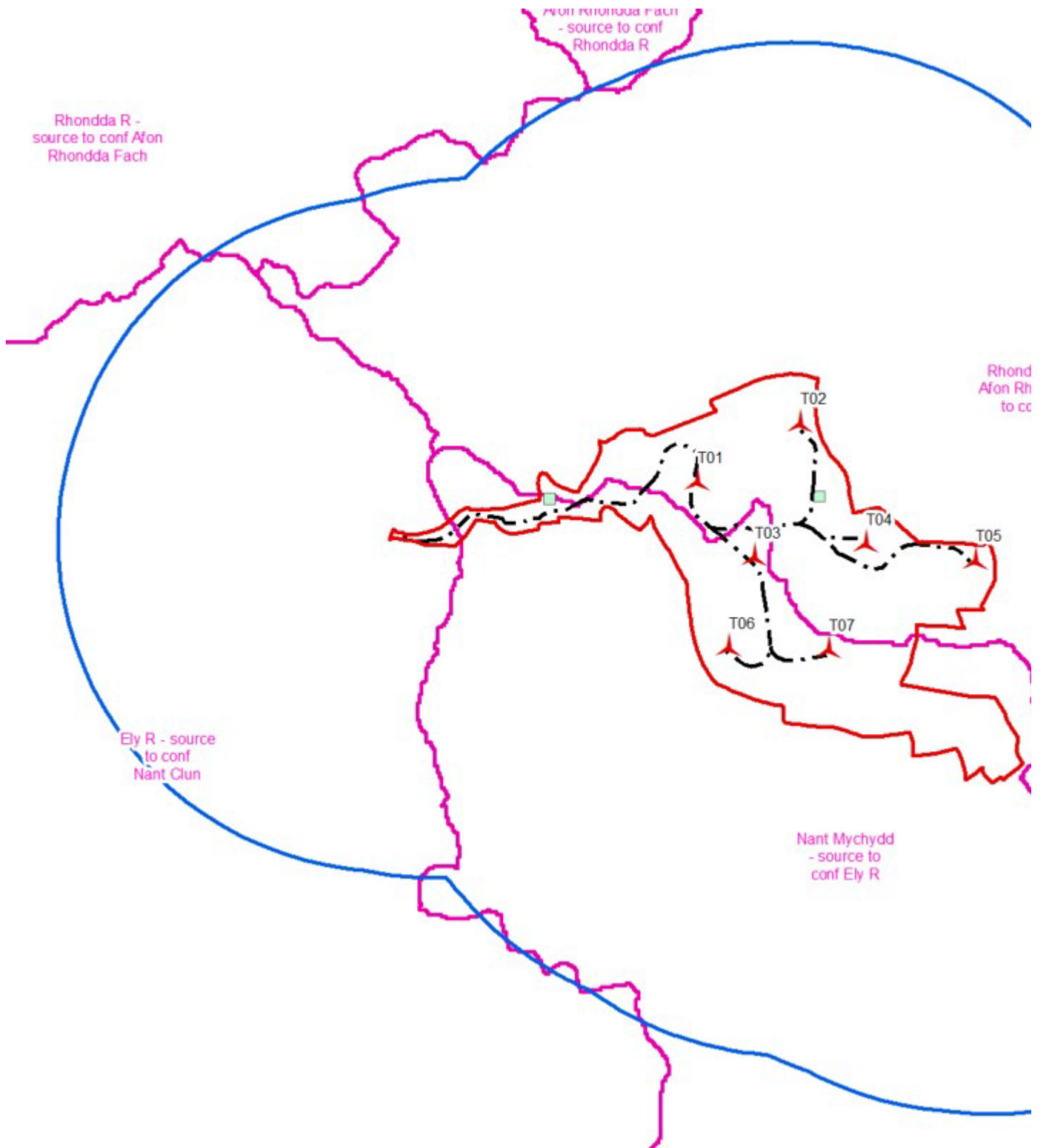
Kind regards,

[Redacted signature]



[Redacted signature block]





From: [REDACTED]
 Sent: 28 September 2022 11:02
 To: [REDACTED]
 Subject: RE: ATI-23795a - Data Request Mynydd y Glyn

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi [REDACTED].

Apologies for the delay on this. I have chased up the flood risk team and they have requested more details on the location, i.e. NGR or postcode. The grid reference you provided in previous emails is not within the flood plain requested.

Thanks,

[REDACTED]

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

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

From: [REDACTED]
Sent: 27 September 2022 12:05
To: [REDACTED]
Subject: RE: ATI-23795a - Data Request Mynydd y Glyn

Hello,

I am contacting you to ask about part 5 of the data request in the emails below.
I have received all other data requested apart from the Flood Modelling Products in bullet point 5. Please could you let me know when this data will be available?

Kind regards,

[REDACTED]



[REDACTED]

From: [REDACTED]
Sent: 31 August 2022 15:51

To: [REDACTED]
Subject: ATI-23795a - Data Request Mynydd y Glyn

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hi [REDACTED]
Please find links to the Rainfall and Biology data below:

<https://naturalresourceswales.sharefile.eu/d-s8ffdc298215e4bfb84ef882e52170bf3>

Rainfall 15min: Dyffryn Isaf, Nelson and Rhiwsaeson
Groundwater in DayMean as 15min not available for this site: Rhydalog North which has a datum of 53.212.

Groundwater level:
I can confirm there are no groundwater level monitoring sites within the requested area.

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The following attribution statement should be included if re-using this data – “Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.*

Thanks,

[REDACTED]

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

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

From: [REDACTED]
Sent: 11 August 2022 10:36
To: [REDACTED] >
Cc: [REDACTED]
Subject: RE: Data Request Mynydd y Glyn

Hello,

Please see responses to your queries in red below.

Kind regards,



1. 15-minute rainfall data for gauges within study area, from the earliest record to present. If none within study area please provide data for the closest gauge:

Please could you fill in the following information and return to me:

- Data Type: **Rainfall**
- Location (Grid Ref or Postcode): **site location= National Grid Reference ST 03626 89459**
- Date From: **oldest available**
- Date To: **present**
- Resolution: **15 min**
- Station Name - only if known: **Trehafod (Rhondda) and Brittonia Bridge (Rhondda)**

2. Licensed surface water and groundwater abstractions within the study area (licence ref, NGR, source, holder, purpose, licensed volume) - excel format;

Please see the following information - <http://lle.gov.wales/catalogue/item/LicensedWaterAbstractions>

3. Groundwater level data (in mAOD) and groundwater quality data for monitoring boreholes within the study area and borehole information (coordinates, aquifer monitored, datum in mAOD). If there are no boreholes within the study area then please provide data for the nearest monitoring borehole - excel format;

Please could you fill in the following information and return to me:

- Data Type: **Groundwater levels and quality data, borehole information (coordinates, aquifer monitored, datum in mAOD)**
- Location (Grid Ref or Postcode): **site location= National Grid Reference ST 03626 89459**
- Date From: **oldest available**
- Date To: **present**
- Resolution **15 min if available**
- Station Name - only if known. **I cannot find this in any of the links provided. Please provide information on any boreholes within the study area, or if none available the closest to the study area.**

Can be found on NRFA website <https://nrfa.ceh.ac.uk/> & <https://www.gaugemap.co.uk/#> or NRW'S RLOI website <https://naturalresources.wales/riverlevels?lang=en>

River levels, rainfall and sea levels - Its: <https://rivers-and-seas.naturalresources.wales/>

UKCFF tidal data can be downloaded free of charge from this website:

https://www.bodc.ac.uk/data/hosted_data_systems/sea_level/uk_tide_gauge_network/

4. Surface water quality data. River and stream quality (chemistry and biological monitoring) data, ideally for within the study area, failing that the nearest available site downstream. Also location data of the sampling points (coordinates, watercourse, sampling point name) - excel format;

Please could you fill in the following information and return to me:

- Data Type – Water quality
- Location (Grid Ref or Postcode) **site location= National Grid Reference ST 03626 89459**
- Date From **oldest available**
- Date To **present**
- Parameters of interest **All available, but particular parameters of interest= pH, temperature, DO, BOD, ammonia, orthophosphate, nitrogen, chloride and phosphate**
- Anything else you think will assist us in fulfilling your request- **please see detailed info in request above.**

5. Flood modelling products 5, 6 and 7 associated with the Afon Rhondda Fawr, Afon Taf and Afon Elai and tributaries within the area of interest

We can provide if the data is available, a product 5 which is the flood model report which is free of charge. Also a product 6 if available, which is the flood model raw output data which is also free of charge. You would need the appropriate software to analyse the results, more information on this is in the attached. We could also provide product 7 which is the full flood model for a fee of £180.00 inclusive of VAT.

Please provide products 5 and 6

From: [REDACTED]
Sent: 09 August 2022 16:20
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Data Request Mynydd y Glyn

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Dear [REDACTED]

Thank you for your email concerning the above. Taking your queries one by one, please see the following:

1. 15-minute rainfall data for gauges within study area, from the earliest record to present. In none within study area please provide data for the closest gauge:

Please could you fill in the following information and return to me:

- Data Type (e.g. Rainfall, Level Data, Flow Data, Groundwater)
- Location (Grid Ref or Postcode)
- Date From
- Date To
- Resolution (e.g. 15min/ Day Total/Day Mean etc)
- Station Name - only if known. Can be found on NRFA website <https://nrfa.ceh.ac.uk/> & <https://www.gaugemap.co.uk/#> or NRW'S RLOI website <https://naturalresources.wales/riverlevels?lang=en>
River levels, rainfall and sea levels - Its: <https://rivers-and-seas.naturalresources.wales/>
UKCFF tidal data can be downloaded free of charge from this website: https://www.bodc.ac.uk/data/hosted_data_systems/sea_level/uk_tide_gauge_network/

2. Licensed surface water and groundwater abstractions within the study area (licence ref, NGR, source, holder, purpose, licensed volume) - excel format;

Please see the following information - <http://lle.gov.wales/catalogue/item/LicensedWaterAbstractions>

3. Groundwater level data (in mAOD) and groundwater quality data for monitoring boreholes within the study area and borehole information (coordinates, aquifer monitored, datum in mAOD). If there are no boreholes within the study area then please provide data for the nearest monitoring borehole - excel format;

Please could you fill in the following information and return to me:

- Data Type (e.g. Rainfall, Level Data, Flow Data, Groundwater)
- Location (Grid Ref or Postcode)
- Date From
- Date To
- Resolution (e.g. 15min/ Day Total/Day Mean etc)
- Station Name - only if known. Can be found on NRFA website <https://nrfa.ceh.ac.uk/> & <https://www.gaugemap.co.uk/#> or NRW'S RLOI website <https://naturalresources.wales/riverlevels?lang=en>

River levels, rainfall and sea levels - Its: <https://rivers-and-seas.naturalresources.wales/>

UKCFF tidal data can be downloaded free of charge from this website:

https://www.bodc.ac.uk/data/hosted_data_systems/sea_level/uk_tide_gauge_network/

4. Surface water quality data. River and stream quality (chemistry and biological monitoring) data, ideally for within the study area, failing that the nearest available site downstream. Also location data of the sampling points (coordinates, watercourse, sampling point name) - excel format;

Please could you fill in the following information and return to me:

- Data Type – Water quality
- Location (Grid Ref or Postcode)
- Date From
- Date To
- Parameters of interest
- Anything else you think will assist us in fulfilling your request

5. Flood modelling products 5, 6 and 7 associated with the Afon Rhondda Fawr, Afon Taf and Afon Elai and tributaries within the area of interest

We can provide if the data is available, a product 5 which is the flood model report which is free of charge. Also a product 6 if available, which is the flood model raw output data which is also free of charge. You would need the appropriate software to analyse the results, more information on this is in the attached. We could also provide product 7 which is the full flood model for a fee of £180.00 inclusive of VAT.

Please also accept this as an acknowledgement that your request has been received.

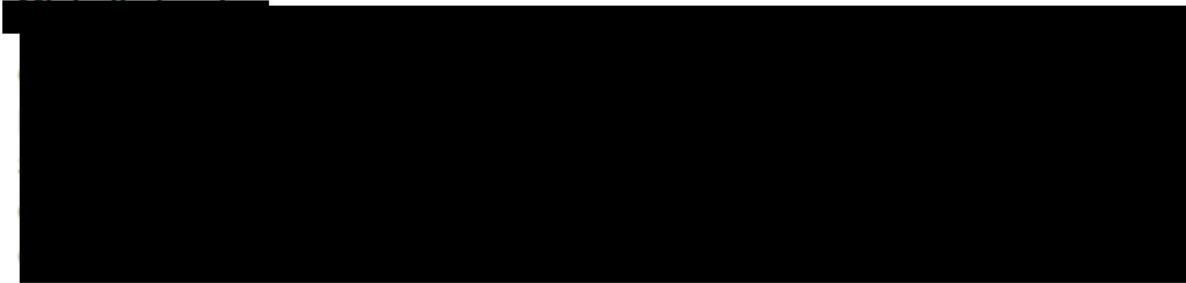
It can take up to [20 working days](#) to supply data that is not available [online](#), therefore if you have any queries on your data request, please [contact us](#).

For further information on what you can expect from us, please visit our website:

[Natural Resources Wales / Contact us](#) or call the Customer Hub on 0300 065 3000 (open 9am-5pm, Monday to Friday).

We look forward to hearing from you in due course.

Yn gywir / Yours sincerely,



Oriau gwaith arferol/Normal working hours – Mon-Fri, 9 to 5

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy.

Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.

cyfoethnaturiol.cymru / naturalresources.wales

[Twitter](#) | [Facebook](#) | [LinkedIn](#) | [Instagram](#)

From: [Redacted]

Sent: 09 August 2022 15:17

To: [Redacted]

Cc: [Redacted]

Subject: Data Request Mynydd y Glyn

Dear Sir / Madam,

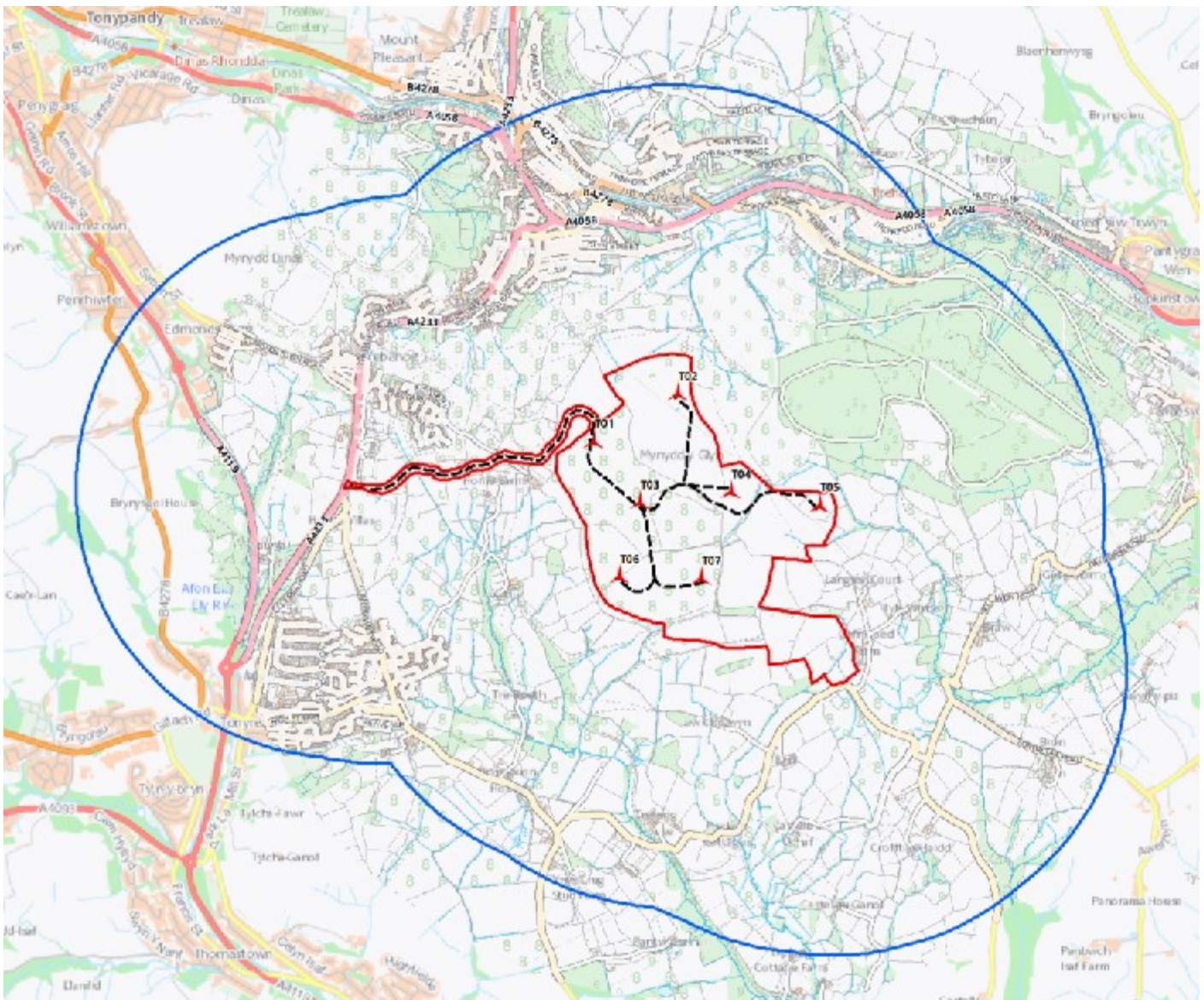
As part of Environmental Impact Assessment and Flood Risk work which Wood Environment & Infrastructure Solutions UK Limited is undertaking for the planning application for Mynydd y Glyn Wind Farm approximately 600m from the southeastern edge of the village of Pant (National Grid Reference ST 03626 89459), I would like to make the information requests below. The planning application boundary (red line) is shown on the attached PDF plan, and wider study area (1.5km buffer) shapefile is included for reference and a screenshot is shown below. The proposed development includes seven wind turbines, substation, temporary construction compound, crane pads and cabling; access tracks and grid connection (overhead line and underground cable). Please note that the current proposed layout may be subject to change following further surveys and consultation.

1. 15-minute rainfall data for gauges within study area, from the earliest record to present. In none within study area please provide data for the closest gauge
2. Licensed surface water and groundwater abstractions within the study area (licence ref, NGR, source, holder, purpose, licensed volume) - excel format;

3. Groundwater level data (in mAOD) and groundwater quality data for monitoring boreholes within the study area and borehole information (coordinates, aquifer monitored, datum in mAOD). If there are no boreholes within the study area then please provide data for the nearest monitoring borehole - excel format;
4. Surface water quality data. River and stream quality (chemistry and biological monitoring) data, ideally for within the study area, failing that the nearest available site downstream. Also location data of the sampling points (coordinates, watercourse, sampling point name) - excel format;
5. Flood modelling products 5, 6 and 7 associated with the Afon Rhondda Fawr, Afon Taf and Afon Elai and tributaries within the area of interest

Please do not hesitate to contact me ([REDACTED] (cc'd)) if you have any specific queries about this request.

Kind regards,
[REDACTED]



[REDACTED]




WOOD

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Annex C

Estimation of Surface water Runoff Attenuation Volumes

| | | |
|---|--|---|
| AMEC Foster Wheeler Group Ltd | | Page 1 |
| Booths Park Chelford Road Knutsford Cheshire WA16 8QZ | Mynydd y Glyn Drainage Strategy |  |
| Date 04/10/2022 18:49 File Ditch with Infiltration.... | Designed by phillip.clay Checked by | |
| Innovyze | Source Control 2018.1.1 | |

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 1659 Urban 0.000
Area (ha) 1.000 Soil 0.400 Region Number Region 9

Results 1/s

QBAR Rural 9.3
QBAR Urban 9.3

Q100 years 20.4

Q1 year 8.2
Q30 years 16.5
Q100 years 20.4

Print

Close Report



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

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.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics Default Edited

SOIL type:

HOST class:

SPR/SPRHOST:

Hydrological characteristics Default Edited

SAAR (mm):

Hydrological region:

Growth curve factor 1 year:

Growth curve factor 30 years:

Growth curve factor 100 years:

Growth curve factor 200 years:

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): | <input type="text" value="7.88"/> | <input type="text" value="7.88"/> |
| 1 in 1 year (l/s): | <input type="text" value="6.94"/> | <input type="text" value="6.94"/> |
| 1 in 30 years (l/s): | <input type="text" value="14.03"/> | <input type="text" value="14.03"/> |
| 1 in 100 year (l/s): | <input type="text" value="17.19"/> | <input type="text" value="17.19"/> |
| 1 in 200 years (l/s): | <input type="text" value="19.4"/> | <input type="text" value="19.4"/> |

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.


| | | |
|---|---|---|
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| Innovyze | Source Control 2018.1.1 | |

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 295 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m ³) | Status |
|-----------------|---------------|---------------|------------------------|------------------------------|------------|
| 15 min Summer | 99.796 | 0.096 | 5.0 | 53.3 | O K |
| 30 min Summer | 99.834 | 0.134 | 5.0 | 82.0 | O K |
| 60 min Summer | 99.878 | 0.178 | 5.0 | 114.6 | O K |
| 120 min Summer | 99.912 | 0.212 | 5.0 | 140.1 | O K |
| 180 min Summer | 99.931 | 0.231 | 5.0 | 154.5 | O K |
| 240 min Summer | 99.942 | 0.242 | 5.0 | 162.9 | O K |
| 360 min Summer | 99.953 | 0.253 | 5.0 | 171.2 | Flood Risk |
| 480 min Summer | 99.957 | 0.257 | 5.0 | 174.2 | Flood Risk |
| 600 min Summer | 99.958 | 0.258 | 5.0 | 174.4 | Flood Risk |
| 720 min Summer | 99.956 | 0.256 | 5.0 | 173.0 | Flood Risk |
| 960 min Summer | 99.948 | 0.248 | 5.0 | 167.3 | O K |
| 1440 min Summer | 99.928 | 0.228 | 5.0 | 152.0 | O K |
| 2160 min Summer | 99.896 | 0.196 | 5.0 | 128.3 | O K |
| 2880 min Summer | 99.868 | 0.168 | 5.0 | 107.2 | O K |
| 4320 min Summer | 99.825 | 0.125 | 5.0 | 74.7 | O K |
| 5760 min Summer | 99.795 | 0.095 | 5.0 | 52.2 | O K |
| 7200 min Summer | 99.775 | 0.075 | 5.0 | 37.6 | O K |
| 8640 min Summer | 99.762 | 0.062 | 5.0 | 28.0 | O K |


| Storm Event | Rain (mm/hr) | Flooded Volume (m ³) | Time-Peak (mins) |
|-----------------|--------------|----------------------------------|------------------|
| 15 min Summer | 109.958 | 0.0 | 17 |
| 30 min Summer | 80.369 | 0.0 | 31 |
| 60 min Summer | 55.890 | 0.0 | 62 |
| 120 min Summer | 35.770 | 0.0 | 120 |
| 180 min Summer | 27.652 | 0.0 | 180 |
| 240 min Summer | 23.021 | 0.0 | 240 |
| 360 min Summer | 17.684 | 0.0 | 304 |
| 480 min Summer | 14.587 | 0.0 | 370 |
| 600 min Summer | 12.523 | 0.0 | 434 |
| 720 min Summer | 11.033 | 0.0 | 504 |
| 960 min Summer | 8.996 | 0.0 | 644 |
| 1440 min Summer | 6.715 | 0.0 | 920 |
| 2160 min Summer | 5.014 | 0.0 | 1320 |
| 2880 min Summer | 4.101 | 0.0 | 1700 |
| 4320 min Summer | 3.146 | 0.0 | 2424 |
| 5760 min Summer | 2.646 | 0.0 | 3120 |
| 7200 min Summer | 2.343 | 0.0 | 3824 |
| 8640 min Summer | 2.140 | 0.0 | 4496 |

| | | |
|---|---|---|
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Summary of Results for 100 year Return Period (+20%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m ³) | Status |
|------------------|---------------|---------------|------------------------|------------------------------|------------|
| 10080 min Summer | 99.755 | 0.055 | 5.0 | 22.2 | O K |
| 15 min Winter | 99.796 | 0.096 | 5.0 | 53.2 | O K |
| 30 min Winter | 99.834 | 0.134 | 5.0 | 81.9 | O K |
| 60 min Winter | 99.878 | 0.178 | 5.0 | 114.5 | O K |
| 120 min Winter | 99.912 | 0.212 | 5.0 | 140.2 | O K |
| 180 min Winter | 99.931 | 0.231 | 5.0 | 154.8 | O K |
| 240 min Winter | 99.943 | 0.243 | 5.0 | 163.7 | O K |
| 360 min Winter | 99.953 | 0.253 | 5.0 | 171.2 | Flood Risk |
| 480 min Winter | 99.955 | 0.255 | 5.0 | 172.7 | Flood Risk |
| 600 min Winter | 99.954 | 0.254 | 5.0 | 171.5 | Flood Risk |
| 720 min Winter | 99.949 | 0.249 | 5.0 | 168.2 | O K |
| 960 min Winter | 99.935 | 0.235 | 5.0 | 157.7 | O K |
| 1440 min Winter | 99.901 | 0.201 | 5.0 | 132.0 | O K |
| 2160 min Winter | 99.851 | 0.151 | 5.0 | 94.4 | O K |
| 2880 min Winter | 99.809 | 0.109 | 5.0 | 63.3 | O K |
| 4320 min Winter | 99.758 | 0.058 | 5.0 | 24.5 | O K |
| 5760 min Winter | 99.748 | 0.048 | 4.6 | 16.9 | O K |
| 7200 min Winter | 99.745 | 0.045 | 4.0 | 15.0 | O K |
| 8640 min Winter | 99.743 | 0.043 | 3.7 | 13.7 | O K |


| Storm Event | Rain (mm/hr) | Flooded Volume (m ³) | Time-Peak (mins) |
|------------------|--------------|----------------------------------|------------------|
| 10080 min Summer | 1.995 | 0.0 | 5152 |
| 15 min Winter | 109.958 | 0.0 | 16 |
| 30 min Winter | 80.369 | 0.0 | 31 |
| 60 min Winter | 55.890 | 0.0 | 60 |
| 120 min Winter | 35.770 | 0.0 | 118 |
| 180 min Winter | 27.652 | 0.0 | 174 |
| 240 min Winter | 23.021 | 0.0 | 230 |
| 360 min Winter | 17.684 | 0.0 | 334 |
| 480 min Winter | 14.587 | 0.0 | 380 |
| 600 min Winter | 12.523 | 0.0 | 458 |
| 720 min Winter | 11.033 | 0.0 | 534 |
| 960 min Winter | 8.996 | 0.0 | 690 |
| 1440 min Winter | 6.715 | 0.0 | 980 |
| 2160 min Winter | 5.014 | 0.0 | 1384 |
| 2880 min Winter | 4.101 | 0.0 | 1732 |
| 4320 min Winter | 3.146 | 0.0 | 2336 |
| 5760 min Winter | 2.646 | 0.0 | 2936 |
| 7200 min Winter | 2.343 | 0.0 | 3672 |
| 8640 min Winter | 2.140 | 0.0 | 4408 |

| | | |
|---|---|---|
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Summary of Results for 100 year Return Period (+20%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (m ³) | Status |
|------------------|---------------------|---------------------|------------------------------|------------------------------------|--------|
| 10080 min Winter | 99.741 | 0.041 | 3.4 | 12.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m ³) | Time-Peak (mins) |
|------------------|-----------------|--|---------------------|
| 10080 min Winter | 1.995 | 0.0 | 5144 |

| | | |
|---|---|---|
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Rainfall Details

| | |
|-----------------------|---------------------------------|
| Rainfall Model | FEH |
| Return Period (years) | 100 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 303198 189718 ST 03198 89718 |
| Data Type | Point |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 1.000 |
| Cv (Winter) | 1.000 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +20 |

Time Area Diagram

Total Area (ha) 0.250

| Time (mins) | | Area |
|-------------|-----|-------|
| From: | To: | (ha) |
| 0 | 2 | 0.250 |

| | | |
|---|---|---|
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Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

| | | | |
|--------------------------------------|---------|-------------------------|--------|
| Infiltration Coefficient Base (m/hr) | 0.03600 | Width (m) | 50.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 50.0 |
| Max Percolation (l/s) | 694.4 | Slope (1:X) | 1000.0 |
| Safety Factor | 5.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 99.700 | Membrane Depth (m) | 0 |

