Galileo 03 Ltd.

Mynydd Ty-talwyn Energy Park - Environmental Statement Volume III

Appendix 6.2: Flood Consequences Assessment and Surface Water Drainage Statement

Project Reference: 663870

JUNE 2026

RSK GENERAL NOTES

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK LDE Ltd.

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1 INTRODUCTION

1.1.1 This report (Flood Consequence Assessment (FCA) and Surface Water Drainage Statement) has been prepared by RSK Land and Development Engineering Ltd (RSK) on behalf of Galileo 03 Ltd (part of Galileo Empower UK Ltd) (hereinafter referred to as 'Galileo' or the 'Applicant'). The assessment is in support of the DNS Application for Mynydd Ty-talwyn Energy Park (the 'Proposed Development'). The 'Site' is defined as the land within the redline boundary in which the Proposed Development is located. The Proposed Development comprises the construction and operation of up to six wind turbines, ground mounted solar photovoltaic (PV) modules, one project substation and ancillary infrastructure works.

1.1.2 This assessment has been prepared in accordance with the Planning Policy Wales (PPW)[1] and its accompanying Technical Advice Note 15 (TAN15)[2], the Interim Code of Practice for Sustainable Drainage[3], BS 8533-2017 Assessing and Managing Flood Risk in Development Code of Practice[4] and the Recommended Non-Statutory Standards for Sustainable Drainage (SuDS) in Wales[5], with site-specific advice from Natural Resources Wales (NRW), the Lead Local Flood Authority (LLFA), the Local Planning Authority (LPA), and the client.

1.1.3 The PPW/TAN 15 sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. The key definitions are:

1.1.4 "Flood risk areas" means land within Zone 1, and Zones 2, 3 and the TAN 15 Defended Zones taken from the Flood Map for Planning; and

- "Flood risk" means risk from all sources of flooding - including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources. The main sources of flooding in Wales are generally river, coastal or flooding from surface water and small watercourses.

[1] Welsh Assembly Government (2024) Planning Policy Wales Edition 12

[2] Welsh Assembly Government (2025), Planning Policy Wales Technical Advice Note 15: Development, flooding and coastal erosion, last updated March 2026.

[3] DEFRA (2004), 'Interim Code of Practice for Sustainable Drainage Systems' National SUDS Working Group

[4] BSI (2011), 'BS 8533-2011 Assessing and managing flood risk in development Code of practice'

[5] Welsh Assembly Government (2016) 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems'

2 CONTEXT AND SCOPE OF WORK

2.1.1 A FCA is required to establish the flood risk associated with the Proposed Development and to propose suitable mitigation, if required, to reduce the risk to a more acceptable level.

2.1.2 The scope of work relating to a FCA is based on the guidance provided in PPW and its accompanying TAN15.

2.1.3 A site-specific FCA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. The scope of this assessment therefore comprises the following elements:

- To review plans, planning information and other studies to determine existing site conditions;
- To obtain information on the hydrology and hydrological regime in and around the site;

2.1.4 To obtain the views of the NRW/LLFA including scope, location and impacts;

- To determine the extent of new flooding provision and the influence on the site; and,
- To assess the impact on the site from climate change effects and anticipated increases in rainfall.

2.1.5 The scope of work relating to a Drainage Statement is based on the guidance provided in PPW and its accompanying TAN15.

2.1.6 A Drainage Statement is required where planning permission is being sought before Sustainable Drainage Systems (SuDS) Approving Body (SAB) approval. The approval of SuDS by the SAB is independent of the planning process. TAN15 recommends running the SAB application in parallel with the planning application, but it does accept that this isn't always viable. Where planning permission is sought first, a Drainage Statement aims to ensure that the scheme should, in principle, be capable of obtaining SAB approval subsequent to the planning approval. TAN15 states that the Drainage Statement should outline how it is proposed to integrate SuDS into the scheme, to provide the planning authority with confidence the scheme incorporates SuDS appropriately and is subsequently likely to obtain SAB approval.

2.1.7 Figure 3.1 of TAN15 sets out the requirements of a Drainage Statement, this includes:

- existing drainage arrangements;
- existing and proposed permeable area (m^2);
- description of whether infiltration is possible, whether the applicant will collect water for re-use and where runoff will be discharged to;

2.1.8 consultations with the relevant authority (e.g., NRW/LLFA/water authority) regarding the acceptability of discharge locations;

- a description of the proposed SuDS and how they will be accommodated within the scheme; and
- details of intended maintenance requirements including whether SuDS will be adopted by the SAB.

2.1.9 The level of detail required for the SAB application would be much greater than this initial Drainage Statement and would include full drainage designs and supporting calculations to demonstrate that SuDS have been designed in accordance with the Statutory National Standards for SuDS. It would also need to cover adoption and management arrangements (including funding mechanisms). A full SAB application and detailed drainage design will be prepared in the future, subject to the grant of planning permission.

3 SITE DESCRIPTION

3.1 Location

3.1.1 The Site is located on land to the north of New Road, Bridgend, CF32 0BS. **Figure 3.1** shows a Site location map. The Site is located at National Grid Reference: 286732 E, 186045 N.

3.1.2 The total Site area covers approximately 578 hectares (ha) and comprises agricultural land, farm buildings and woodland. The Site comprises a main, larger parcel of land and a smaller second parcel of land to the west of Craig yr Aber Woods, connected to the larger parcel via an existing highway. There are various roads which pass through the Site; Ffordd-Y-Gyfraith, Cwm Risca Lane and multiple private tracks.

3.1.3 To the east of the Site is A4063 and further agricultural land. To the south is New Road, agricultural land and residential properties and an animal farm off Ffordd-Y-Gyfraith and Cwm Risca Lane. To the west, Craig yr Aber Woods and Nant Craigyraber (Ordinary Watercourse) are located between the western boundary of the main Site area and the smaller area, with further agricultural fields and farms beyond. To the north are agricultural fields and farms.

Figure 3.1: Site location plan (Google Satellite basemap)

3.2 Topography

3.2.1 The topography of the Site falls in multiple directions from localised high points. Mynydd Beaden is a high point located in the southern extent of the Site, with a peak of approximately 250 metres above ordnance datum (mAOD). The land falls away from this point in multiple directions, with the majority of the southern extent falling in a southernly direction towards New Road.

3.2.2 Mynydd Ty-talwyn is the second localised high point on-site. This is located within the central western area of the Site and has a peak of approximately 232 mAOD. The land falls in multiple directions from this point, with the northern extent of the site predominantly falling in a north-easterly direction. There are also steeper falls adjacent to Nant Craigyraber and its tributaries on-site. The smaller Site parcel to the west of Nant Craigyraber falls south and south-east and is located on a high plateau of approximately 260 mAOD.

3.2.3 LiDAR[6] data has been obtained for the site and reproduced as a map, shown in **Figure 3.2**, which shows the general fall of the site.

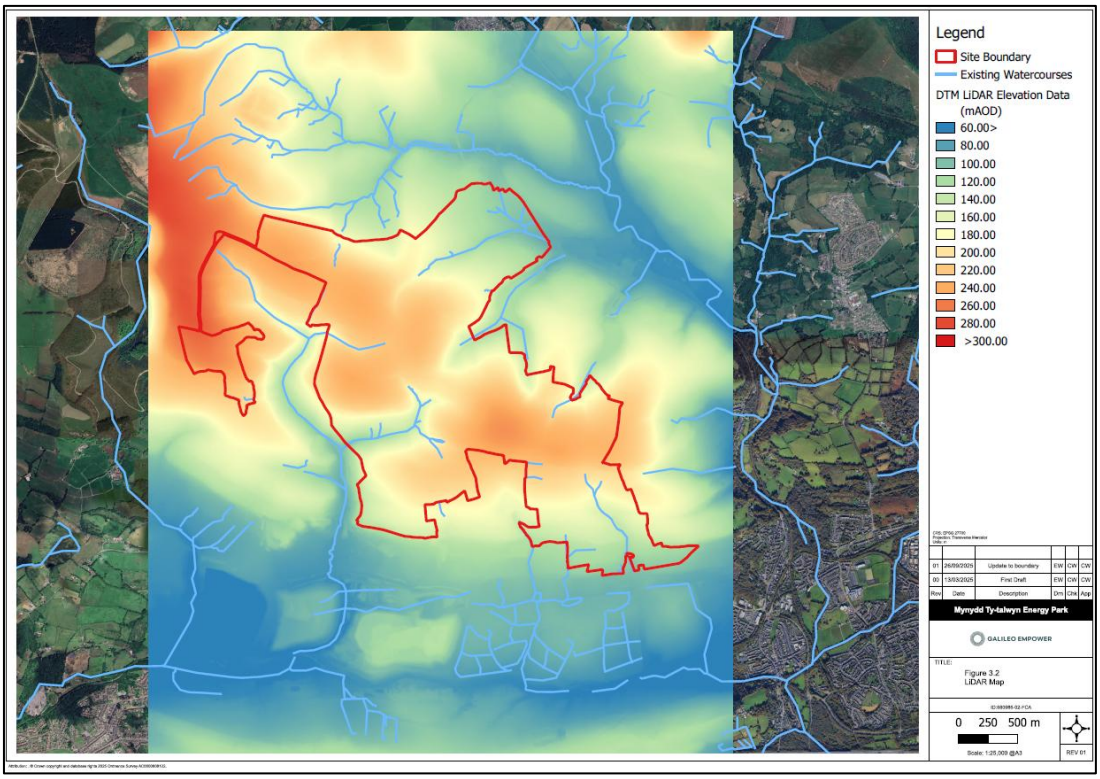


Figure 3.2: Lidar elevation map

[6] Defra, 'Defra Survey Data Download'. Available at: https://environment.data.gov.uk/survey.

3.3 Hydrology

Hydrological setting

3.3.1 A watercourse plan based upon available online mapping can be found in **Annex A**.

3.3.2 There are two tributary watercourses of Nant Craigyraber on-site, the most significant being Nant Fadog which discharges to Nant Craigyraber's downstream extent. Nant Craigyraber is an Ordinary Watercourse located between the two parcels of the Site, along the western boundary of the main Site parcel, within an area of ancient woodland, conveying flow south for 4.2 km, beneath New Road and through the disused Margam Opencast Coal Mine. It then joins Nant Iorweth-goch which flows west for approximately 1.2 km, converging with Afon Cynffig 2.0 km south-west of the Site.

3.3.3 In the north-east of the Site are multiple unnamed watercourses and Nant Gwyn which are tributaries of Afon Llynfi and convey flow north-west/west. Afon Llynfi is a designated Main River located a minimum of 600 m east from the Site and conveys flow south, roughly following the route of the A4063 on its eastern side.

3.3.4 Off-site to the north are tributary watercourses of Nant y Gadlys, named Nant Bryncynan and Nant y Castell. Nant y Gadlys conveys flow east, and is a designated Main River, converging with Afon Llynfi approximately 0.65 km north-east of the Site.

3.3.5 There are three small Ordinary Watercourses in the south of the Site: Nant-y-gedd, Nant Cwm-bach and an unnamed watercourse, which all convey flow south. There is an extensive watercourse network located off-site to the south of the Site and south of New Road, associated with Parc Slip Nature Reserve. This network has hydrological links to the small watercourses emerging from the south of the Site which convey flow south into this network. This network eventually conveys flow east, eventually discharging to Afon Llynfi.

3.3.6 The Ordinary Watercourse of Afon Cynffig is located approximately 0.7 km west of the smaller western parcel of the Site. This watercourse conveys flows south, beneath Crown Road and then west, away from the Site. Nant Iorweth-goch is a tributary of this watercourse, downstream of the site. Afon Cynffig becomes a designated Main River as the two watercourses converge, 2.0 km south-west of the Site.

3.3.7 Nant Cedfyw is an off-site Ordinary Watercourse and conveys flow south, converging with Afon Llynfi approximately 1.4 km east of the Site.

3.3.8 It is noted that the main parcel of the Site is split into two main catchments: one draining to Nant Craigyraber to the south-west of the main parcel and the second draining to Nant y Gadlys and Afon Llynfi to the north/east/south-east. The smaller western parcel of the Site drains to Nant Craigyraber to the south-east and to Afon Cynffig to the south-west.

3.3.9 It is also noted there are no Main Rivers within the Site Boundary and all the on-site watercourses aforementioned are designated as Ordinary Watercourses and emerge on-site, noted as springs on OS mapping.

3.4 Geology

3.4.1 Based on published British Geological Survey online geological records[7] for the area, the Site exhibits the following geology:

- Superficial Geology (split):
  - Majority of the site: None recorded.
  - North-eastern extent of the Site associated with Nant Gadlys tributaries: Till, Devensian - Diamicton. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.
  - North-eastern extent of the Site associated with Nant Gadlys tributaries: Alluvium - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.
- Bedrock Geology (split) shown in **Figure 3.3**:
  - Majority of the site: Brithdir Member – Sandstone. Sedimentary bedrock formed between 309.5 and 308 million years ago during the Carboniferous period.
  - Banding across the south of the site: Llynfi Member - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 315.2 and 309.5 million years ago during the Carboniferous period.
  - Banding in the south-eastern corner: South Wales Middle Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 318 and 309.5 million years ago during the Carboniferous period.
  - Banding in the south-eastern corner: South Wales Upper Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 315.2 and 308 million years ago during the Carboniferous period
  - North-eastern corner: Brithdir Member - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 309.5 and 308 million years ago during the Carboniferous period.

[7] British Geological Survey online mapping, available at http://mapapps.bgs.ac.uk/geologyofbritain/home.html?location=&gobBtn=go

- North-eastern corner: Hughes Member - Sandstone. Sedimentary bedrock formed between 309.5 and 308 million years ago during the Carboniferous period.

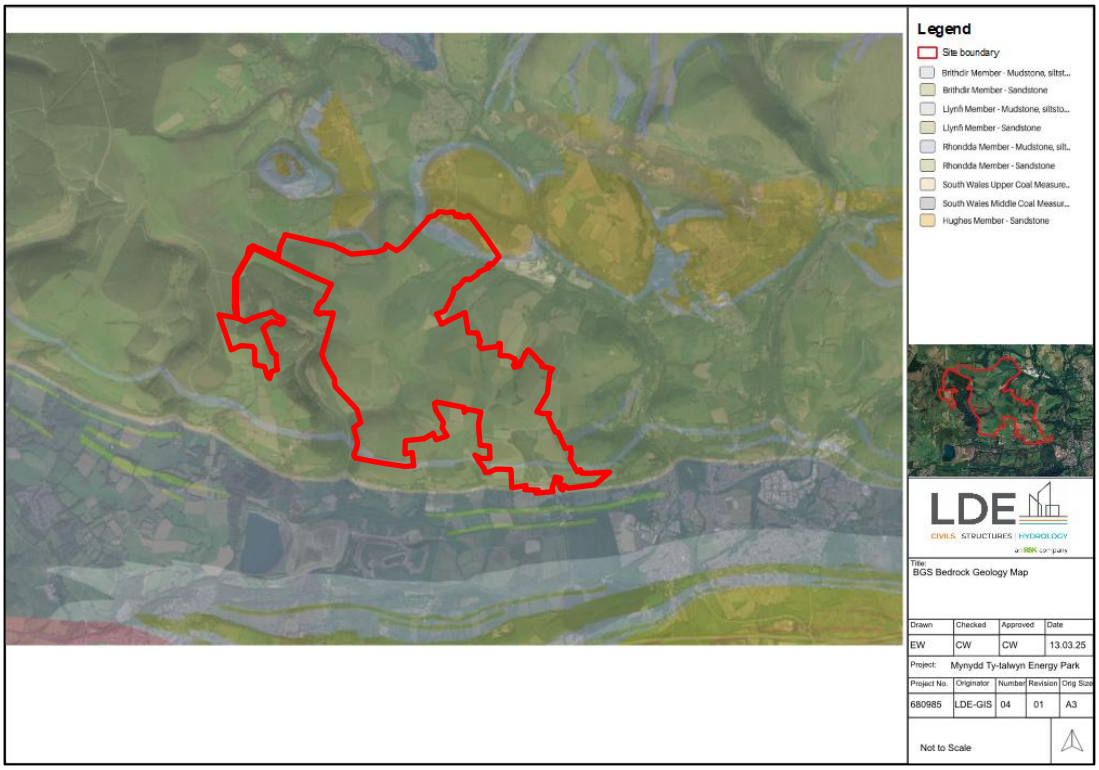


Figure 3.3: BGS bedrock geology classification

3.5 Hydrogeology

3.5.1 Hydrogeological information was obtained from the online Magic Maps and BGS mapping services. The maps indicate that the Site is underlain by a Secondary A bedrock aquifer and is not underlain by a superficial aquifer.

3.5.2 The Site is not located within a groundwater Source Protection Zone.

3.6 Development Proposals

3.6.1 The Site is proposed for a development of six wind turbines, ground mounted solar photovoltaic (PV) modules,, one project substation and ancillary infrastructure works including access tracks.

3.6.2 The Proposed Development is illustrated in **Annex B**.

4 LEGISLATION AND POLICY CONTEXT

4.1 National policy

Table 4.1: National legislation and policy context

Legislation	Key provisions
Planning Policy Wales Edition 12 (2024)	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.
Technical Advice Note 15 (2026)	PPW is supported by the Technical Advice Note 15, which, provides technical guidance which supplements the policies set out in PPW and Future Wales in relation to flooding and coastal erosion. It provides a framework within which the flood risks arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed. It also provides advice on the consequences of the risks and adapting to and living with flood risk.
The National Development Framework: Future Wales – the National Plan 2040[8]	The Planning Act requires the Welsh Ministers to produce and keep up- to-date the National Development Framework (Future Wales). Future Wales sets out the Welsh Government's land use priorities and provides a national land use framework for Strategic Development Plans (SDPs) and Local Development Plans (LDPs). Future Wales concentrates on development and land use issues of national significance, indicating areas of major opportunities and change, highlighting areas that need protecting and enhancing and helping to co-ordinate the delivery of Welsh Government policies to maximise positive outcomes.
Flood and Water Management Act 2010[9]	This legislation was formally ratified in May 2010 with the aim of implementing the findings of the 2007 Pitt Review and co-ordinating control of drainage and flood issues. There are a number of increased responsibilities within the act that affect adoption of SuDS features and the role of the NRW to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.

[8] 'The National Development Framework: Future Wales – the National Plan 2040', Welsh Government, February 2021,

[9] Flood and Water Management Act 2010

Legislation	Key provisions
Water Resources Act 1991[10]	Section 24 – NRW is empowered under this Act to maintain and improve the quality of 'controlled' waters Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters Section 88 – Discharge consents are required for discharges to controlled waters
Water Framework Directive 2000[11]	The Water Framework Directive (WFD) requires all inland and coastal waters to reach 'good' chemical and biological status. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by floodwaters. The main impact of the WFD on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The WFD aims to protect conservation sites identified by the EC Habitats Directive and Birds Directive that have water-related features, by designating them as 'protected sites'.
Planning (Hazardous Substances) (Wales) Regulations 2015 [12]	These Regulations consolidate, with amendments, the Planning (Hazardous Substances) Regulations 1992 (S.I. 1992/656) and subsequent amending instruments insofar as they apply to Wales. They also include provision relating to the period for determination of procedure under sections 20 and 21 of the Planning (Hazardous Substances) Act 1990 ("the PHSA"). The regulations outline the quantity of hazardous substances that can be stored on site prior to the requirement for hazardous substances consent.

4.2 Local policy

4.2.1 Local policies ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and making development safe without increasing flood risk elsewhere and where possible, reducing flood risk. LDPs set out a long-term spatial vision, objectives and the planning and development strategy for their relevant County. Relevant policies relating to flood risk, drainage and hydrology from Bridgend County Borough Council's (BCBC) and Neath Port Talbot Council's (NPTC) Local Development Plans are outlined in **Table 4.2**.

[10] Water Resources Act 1991
[11] European Commission (2000) ,'Directive 2000/60/EC - Water Framework Directive'
[12] The Planning (Hazardous Substances) (Wales) Regulations 2015

Table 4.2: Local policy context

LDP document	Key provisions and policies
Bridgend Replacement Local Development Plan (RLDP) 2018-2033[13] (adopted 2024)	**SP4: Mitigating the Impact of Climate Change** All development proposals must make a positive contribution towards tackling the causes of, and adapting to the impacts of Climate Change. Means of achieving this may include: 1) Having a location and layout which reflects sustainable transport and access principles, thereby reducing the overall need to travel (active travel); 2) Having low / zero carbon energy requirements by reducing energy demand, and promoting energy efficiency; 3) Utilising low carbon, local materials and supplies (adopting circular economy principles); 4) Encouraging the development of renewable and low/zero carbon energy generation; 5) Having a design, layout and landscaping which: (i) helps wildlife and habitats to adapt to the changing climate; (ii) assists cooling of the urban environment, including the use of passive building techniques where appropriate; 6) Using resources more efficiently, including averting waste generated from demolition and minimising waste water use and pollution; 7) Directing development away from flood risk areas, and avoiding development that increases the risk of flood and coastal erosion, including through the deployment of sustainable urban drainage systems where relevant. All applications for development proposals must clearly demonstrate how they contribute to climate change mitigation and adaption.
Neath Port Talbot County Borough Council Local Development Plan (2011-2026)[14]	**Policy SP 1 Climate Change** The causes and consequences of climate change will be addressed by implementing the following measures. In relation to the causes of climate change: 1. The efficiency and sustainability of the County Borough's settlements will be enhanced through developing more cohesive and efficient settlements and settlement patterns, and consequently more sustainable travel patterns;

[13] Bridgend County Borough Local Development Plan 2018-2033, Bridgend County Borough Council, adopted March 2024

[14] Neath Port Talbot County Borough Council Local Development Plan (2011-2026), Neath Port Talbot County Borough Council, adopted January 2016.

LDP document	Key provisions and policies
	2. Greenhouse gas emissions from transport will be minimised through encouraging freight / commercial transport by alternatives to road (e.g. rail or sea); 3. Dependence on the private car and the need to travel in general will be reduced through promoting alternative means of transport and more efficient use of existing facilities, co-location and joint use of facilities; 4. Provision will be made for the County Borough's appropriate contribution to renewable and low carbon energy generation. In relation to the consequences of climate change: 1. Likely increased flood risk will be taken into account and addressed by ensuring that there is greater resilience by avoiding development on land that is at risk from flooding in the first instance in accordance with the sequential approach set out in national guidance or in locations that could increase the risk of flooding elsewhere; 2. The fragmentation of habitats will be minimised and opportunities made for habitat and species change and migration where possible.
Neath Port Talbot Council Replacement Local Development Plan (RLDP) 2023-2038	The adopted local plan will be replaced by the local plan for 2023-2038. This document is still under review and has not yet been adopted.
Bridgend County Borough Council Strategic Flood Consequence Assessment (SFCA) (2020) v2[15]	The BCBC SFCA update has been developed to inform the replacement LDP (LDP 2018-2033). The updated SFCA builds on the previous 2010 SFCA. It provides a robust evidence-base to the development of LDP policies and land allocation decisions. The majority of Porthcawl, Pencoed, Pyle and Maesteg have medium or low risk designation associated with the expected groundwater depths. Areas at high risk of groundwater flooding are present in small parts of the urban areas of the borough including parts of Maesteg, Aberkenfig and Brynmenyn. An area of high groundwater risk is also present to the north of Bridgend, however, this is located outside of the Site. The larger areas of groundwater risk are predominantly present outside of the urban areas in the borough The historic flood maps indicate that Bridgend Town Centre flooded in 1960 when channel capacity was exceeded. The event

[15] Strategic Flood Consequence Assessment Bridgend County Borough Council v2, JBA Consulting, October 2020.

LDP document	Key provisions and policies
	occurred prior to the construction of the current flood defences in the town. Incidents of surface water flooding are concentrated in urban areas and are prevalent in all key settlements and have been taken from the Bridgend Preliminary Flood Risk Assessment.
South West Wales – Stage 1 Strategic Flood Consequence Assessment (2022)[16]	This Stage 1 SFCAhas been commissioned by a group of six Local Planning Authorities (the Councils) in South West Wales (including NPTC). The South West Wales catchment covers a number of counties in South West Wales and includes several major watercourses. The main watercourse is the River Cleddau. A flood risk review of the NPTC area is included in Appendix B1 of the document. There are no incidences of river or tidal flooding within the Site Boundary. It is noted that the majority of the county has groundwater that is at least 5 m below ground surface or lower. Groundwater emergence is also more likely to occur in areas with historic mine workings, with workings forming new pathways between the groundwater body and the surface.
South East Wales – Stage 1 Strategic Flood Consequence Assessment (2022)[17]	This Stage 1 SFCA has been commissioned by a group of ten Local Planning Authorities (the Councils) in South West Wales (including BCBC). A flood risk review for the BCBC area is included in Appendix B of the document. It denotes that the predominant flood risk within the area is from fluvial and tidal sources.
Neath Port Talbot Council Local Flood Risk Management Strategy (2013)[18]	The LFRMS determines the locally significant flood risk for the area, focusing mainly on flooding from surface water, groundwater and Ordinary Watercourses, and helps everyone affected to understand and manage flood risk. It also considers significant interactions with main rivers and sewers.

[16] South West Wales – Stage 1 Strategic Flood Consequence Assessment, JBA Consulting, November 2022.
[17] South East Wales – Stage 1 Strategic Flood Consequence Assessment, JBA Consulting, November 2022.
[18] Neath Port Talbot Council Local Flood Risk Management Strategy, Neath Port Talbot Council, June 2013.

5 SOURCES OF INFORMATION

5.1 NRW consultation

Flood zone maps

5.1.1 NRW Flood Map for Planning is available on their website at: https://flood-map-for-planning.naturalresources.wales/

5.1.2 The Flood Risk Assessment Wales map is available at: https://datamap.gov.wales/maps/new?layergroup=inspire-nrw:FloodRiskAssessmentWales#/

5.1.3 The Welsh Assembly Government's Development Advice Maps which are available at: https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=2

Consultation

5.1.4 NRW was contacted with regard to flood information and available modelling in the vicinity of the site (**Annex C**). They suggested consulting the flood maps and their website for further information. They also stated in a follow up response that "*the flood map in this area is based on a nationally generated Flood Risk Assessment Wales (FRAW) model, this was last updated in 2020. FRAW modelling uses LIDAR data to generate flood outlines with assumptions made about the channel capacity. This modelling was carried out for the production of flood extents only and is not suitable for detailed site specific assessments, therefore we are not able to provide any flood products for your site*".

5.2 BCBC Response

5.2.1 BCBC was contacted to obtain relevant data/guidance and establish key site constraints. A response from from their land drainage team was received and can be found within **Annex D**. The key points are listed below:

- There are no recorded flood events which impact the Site, note that as this is predominantly agricultural land flooding incidents may have gone unreported.
- They hold no records of groundwater or reservoir flooding.
- The nearby areas are crossed by multiple small ditches and watercourses, the area is noted as being historically "wet ground", during prolonged periods of wet weather the ground becomes saturated which affects infiltration and run-off can adversely affect properties downstream.

5.2.2 Proposed discharge rates for any new drainage infrastructure would be limited to greenfield run-off including a 30 % allowance for climate change.

- Flood defence consents will be required for any discharge to watercourse, culverting of watercourses will also require flood defence consent but will only be permitted for short lengths for access purposes.

5.2.3 A SAB application will be required where the cumulative hard surface exceeds 100 m2.

- The Surface Water Drainage Assessment should include drainage routes, disposal methods, discharge points, including temporary works during construction, etc this would form part of the SAB application.

6 SOURCES OF FLOOD RISK

6.1 Criteria

6.1.1 In accordance with PPW and advice from NRW, a prediction of the flood sources and levels is required along with the effects of climate change from the present for the design life of the development (in this case assumed to be 50 years).

6.1.2 The flood risk elements that need to be considered for any site are defined in BS 8533 as the "Forms of Flooding" and are listed as:

- Flooding from Rivers (fluvial flood risk);
- Flooding from the Sea (tidal flood risk);
- Flooding from the Land;
- Flooding from Groundwater;

6.1.3 Flooding from Sewers (sewer and drain exceedance, pumping station failure etc); and

- Flooding from Reservoirs, Canals and other Artificial Structures.

6.1.4 The following sections review each of these in respect of the subject Site.

6.2 Definitions of Risk

6.2.1 **Table 6.1** has been reproduced from Figure 1 (Definition of Flood Map for Planning Flood Zones) within TAN 15 (2025) and details the flood events and standards of protection modelled relevant to each classification.

Table 6.1: Flood Risk from Rivers, Flood Risk from the Sea and Flood Risk from Surface Water & Small Watercourses as shown on the Flood Map for Planning

Flood Zone	Rivers	Sea	Surface Water & Small Watercourses
1	Less than 1 in 1000 (0.1 %) (plus climate change) chance of flooding in a given year		
2	Less than 1 in 100 (1 %) but greater than 1 in 1000 (0.1 %) chance of flooding in a given year, including climate change	Less than 1 in 200 (0.5 %) but greater than 1 in 1000 (0.1 %) chance of flooding in a given year, including climate change	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1 %) chance of flooding in a given year, including climate change
3	A greater than 1 in 100 (1 %) chance of flooding in a given	A greater than 1 in 200 (0.5 %) chance of	A greater than 1 in 100 (1 %) chance of flooding in a given

Flood Zone	Rivers	Sea	Surface Water & Small Watercourses
	year, including climate change	flooding in a given year, including climate	year, including climate change
TAN 15 Defended zone	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard)	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard)	Not applicable

6.2.2 The threat probability has been based upon the Flood Zone designation, with Flood Zone 3 being the highest threat. This has then been assessed in conjunction with the impact this has upon the site, providing a categorisation of risk shown in **Table 6.2** below.

Table 6.2: RSK Flood Risk category matrix from Reservoirs, Groundwater, sewers and other artificial sources

Threat Probability	Low Impact	Medium Impact	High Impact
High	Medium	Medium	High
Medium	Low	Medium	Medium
Low	Low	Low	Low
Very Low	Very Low		

6.3 Climate change

6.3.1 Within the context of the existing flood risk at the Site, and the requirements of the PPW and TAN15, climate change impacts from different flood sources have been considered alongside the present day scenario.

6.3.2 As an overview; climate change can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

6.3.3 In accordance with the requirements of the PPW and following consultation with NRW the latest climate change predictions will be considered within this assessment.

6.3.4 In line with the Flood Consequence Assessments: Climate Change Allowances[19] it is noted that "*The central allowance for the relevant river basin district should be used as the 'design' event to assess the potential impact of climate change as part of an FCA and to inform design levels".* As such, in accordance with Table 1 of this document, for the Western Wales District, a climate change factor of 35 % should be utilised to assess flood risk associated with climate change increases in flows.

6.3.5 In accordance with this document, the changes in the peak rainfall intensity should be applied when assessing the effects of climate change when considering surface water flooding and drainage assessments. The document states that, *"In accordance with TAN15, development proposals should be assessed against the central allowance to inform design levels and against the upper allowance to inform mitigation requirements".* In accordance with Table 2 of this document, a 30 % increase should be applied when assessing the Site against the central allowance and a 40 % increase should be applied when assessing the site against the upper estimate.

6.4 Flooding from rivers (fluvial flood risk)

6.4.1 The NRW Flood Map for Planning 'Flood Risk from Rivers' map shows the extents of flooding from rivers designated as 'Main Rivers' by the NRW. The mapping (**Figure 6.1**) indicates that the majority of the Site is located outside of extents classified as being at flood risk from Main Rivers and is located within Flood Zone 1. A small section of Nant Fadog is designated as Flood Zone 3, however, this appears to remain within channel. Therefore, the Site is considered at **very low** risk from Main River flooding.

[19] Flood Consequence Assessments: Climate Change Allowances, Welsh Assembly Government, September 2021 and last updated March 2026. Available at: https://www.gov.wales/sites/default/files/publications/2026-03/climate-change-allowances-and-flood-consequence-assessments.pdf

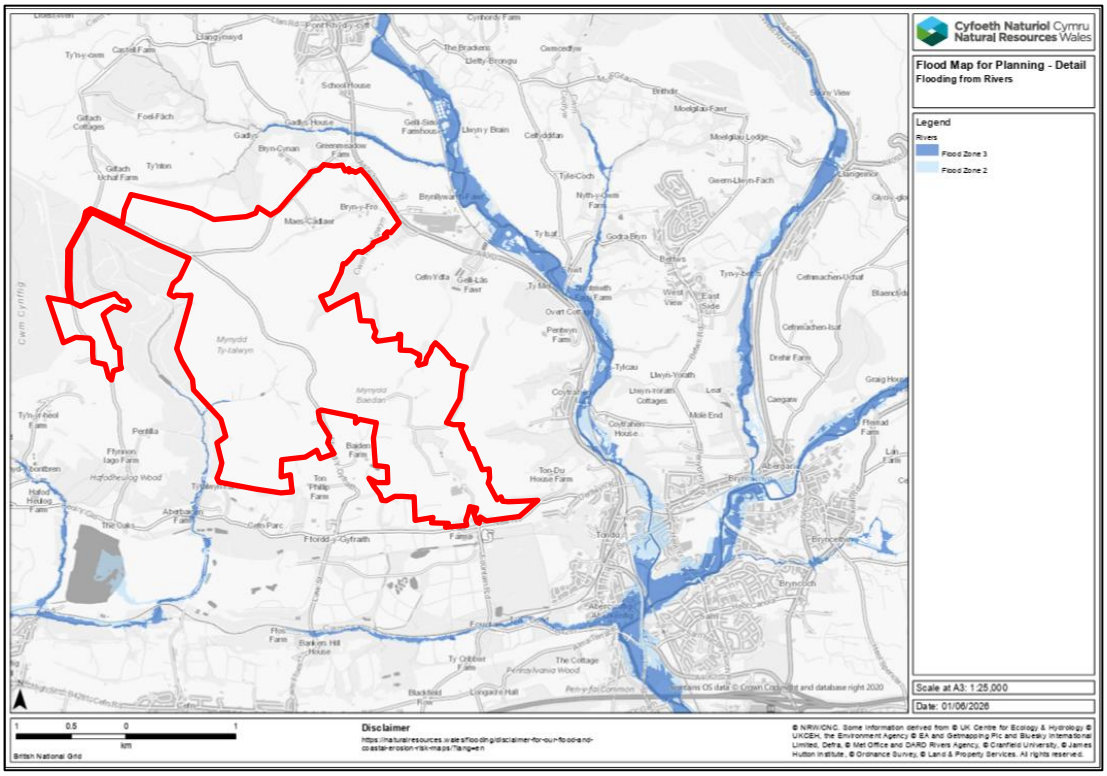


Figure 6.1: Rivers Flood Map for Planning (accessed June 2026)

Climate change

6.4.2 Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks, however, climate change is not expected to increase the fluvial flood risk at the Site due to the modelled risk associated with the Flood Zone 3 designation remaining in channel.

6.5 Flooding from the sea (tidal flood risk)

6.5.1 The tidal flood map for planning (**Figure 6.2**) shows the site to wholly be located within Flood Zone 1.

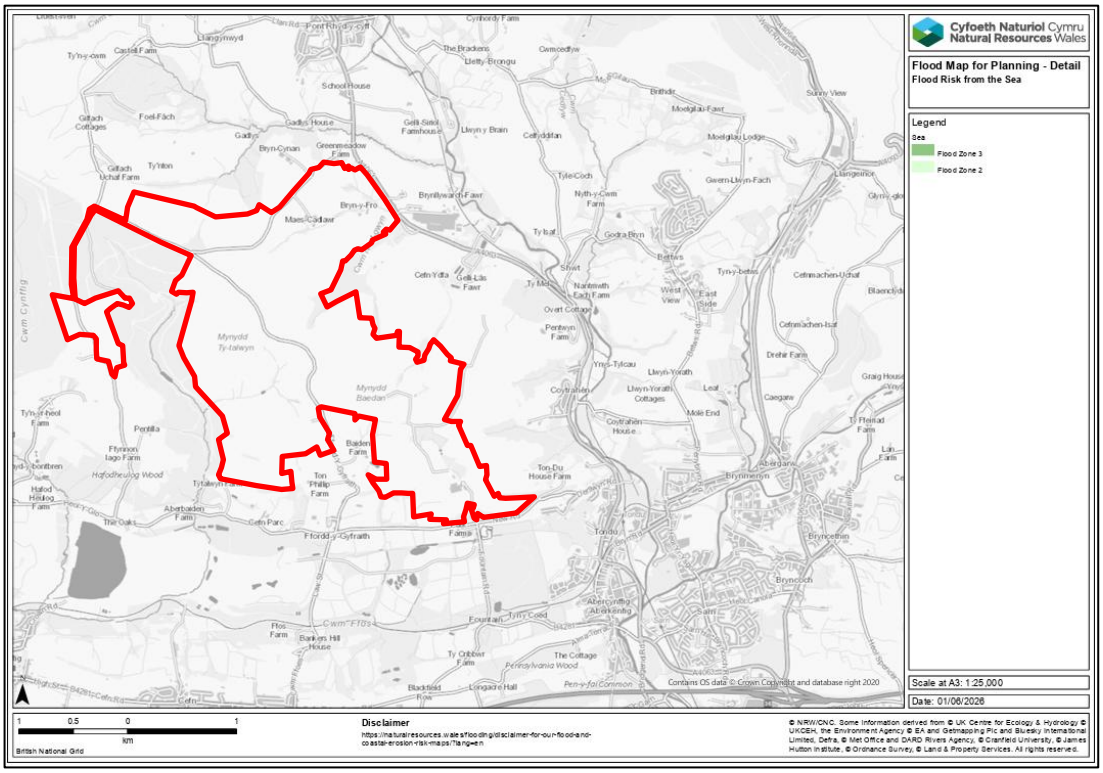


Figure 6.2: Tidal flood map for planning (accessed June 2026)

6.5.2 The site is located inland and at a high topography, therefore, the Site is considered at **very low** risk from tidal flooding.

6.6 Flood Defences

6.6.1 NRW has mapped the locations of flood defences. There are no flood defences located in the nearby vicinity of the Site.

6.7 Flooding from surface water and small watercourses

6.7.1 If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

6.7.2 Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur. Excess surface water flows from the Site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

6.7.3 NRW's surface water flood map for planning (**Figure 6.3**) shows that the majority of the mapped watercourses on-site have associated areas of Flood Zone 3. These areas of high risk are contained within the riparian corridors of the watercourses and do not extend within the agricultural fields which comprise the Site, which remain within Flood Zone 1.

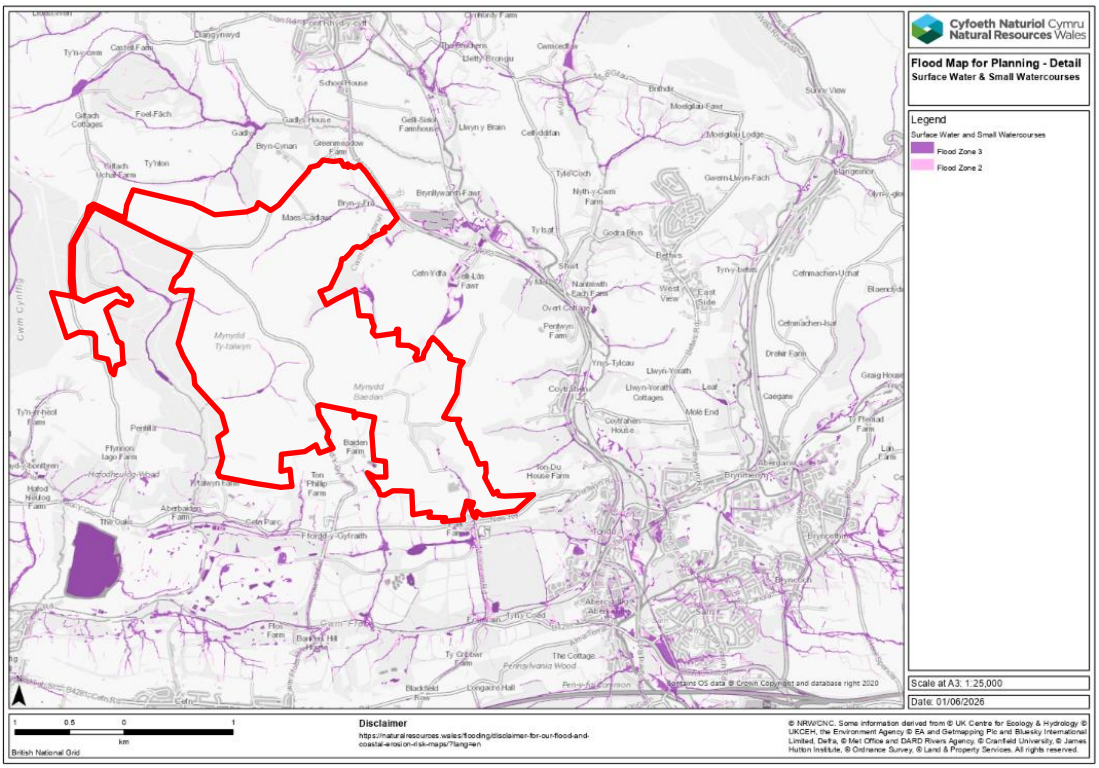


Figure 6.3: Surface water flood map for planning (accessed June 2026)

6.7.4 In line with the mapping, the risk of pluvial flooding to the Site can be considered predominantly **very low**, with localised areas of **high** risk associated with the watercourses.

Climate change

6.7.5 Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. The increase in surface water flood risk is unlikely to be significant in the context of the subject Site due to the modelled risk associated with the Flood Zone 3 designation remaining in channel.

6.8 Flooding from groundwater

6.8.1 Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

6.8.2 It is anticipated that the regional direction of groundwater flow is in line with local topography and towards surface waters. Where the Site is at higher elevation, it is anticipated that groundwater would be relatively deep. In areas of lower-lying ground, the groundwater could be present closer to the ground surface. There are no Source Protection Zones located on-site.

6.8.3 The BCBC SFCA detailed that areas at high risk of groundwater flooding are present in small parts of the urban areas of the borough.

6.8.4 The risk of groundwater flooding affecting the Site is therefore considered **very low**.

Climate change

6.8.5 Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may, however, be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk is likely to be low.

6.9 Flooding from sewers

6.9.1 Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

6.9.2 It has been assumed that the existing drainage systems which serve the farms on-site are serviced by private drainage systems and will remain unchanged following development. Any sewer flooding is likely to be minimal due to the small catchments contributed by the hardstanding areas of the farm buildings. There are narrow hardstanding roads which pass through the Site which are assumed to drain to the land either side of the road and are not served by formal drainage.

6.9.3 The residual sewer flood risk posed to the Site will remain **very low**.

Climate change

6.9.4 The impact of climate change is likely to be negative regarding flooding from sewers. Increased rainfall and more frequent flooding put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and potential flooding. This would increase the frequency of local sewer flooding but would not be significant in terms of the Site.

6.10 Reservoirs

6.10.1 Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

6.10.2 Reservoir flooding is also extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then, reservoir safety legislation has been introduced to ensure reservoirs are maintained.

6.10.3 The reservoir flood map for planning (**Figure 6.4**) shows that the Site is not in an area at risk of flooding from this source.

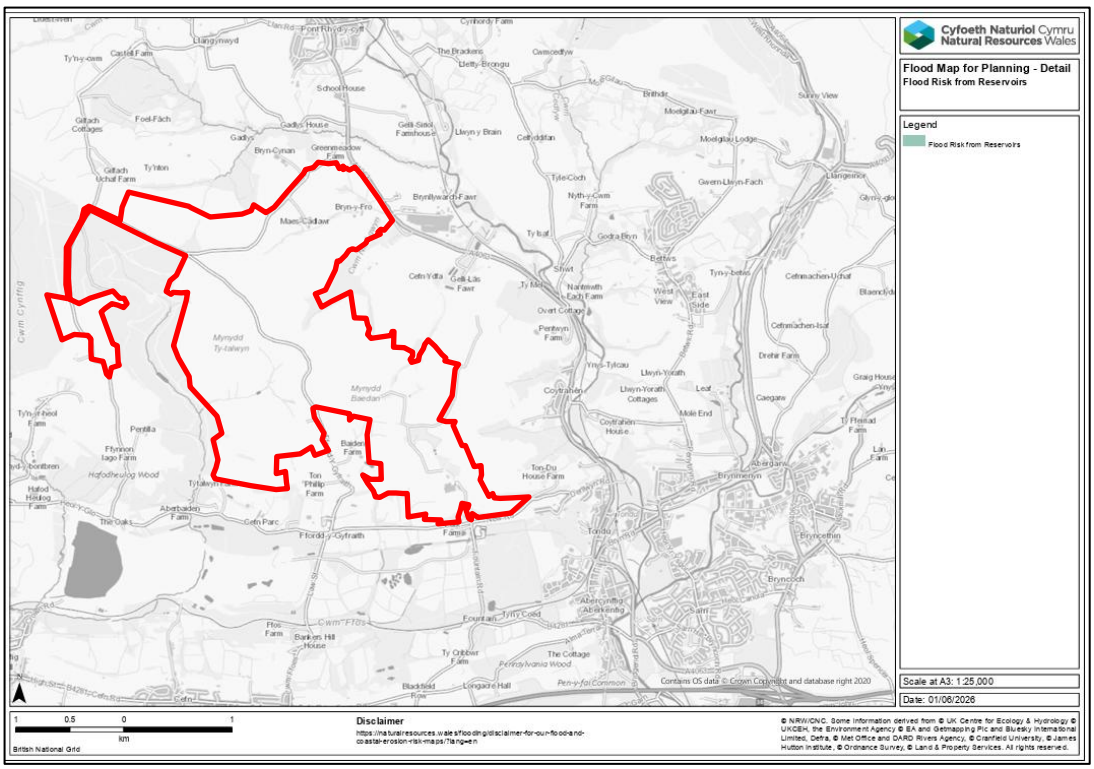


Figure 6.4: Reservoir flood map for planning (accessed June 2026)

Climate change

6.10.4 Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this Site.

6.11 Canals

6.11.1 There are no canals within 2 km of the Site, therefore no risk is attributed to this source.

6.12 Flood risk resulting from the Proposed Development

6.12.1 The Proposed Development is for the construction and subsequent operation (and decommissioning) of energy infrastructure. There will be small areas of hardstanding contributed by the Proposed Development from the substation, solar panel posts, solar transformer bases, wind turbine hardstandings and new track. As such, a suitable surface water drainage strategy will be developed to control the additional quantities of runoff entering the nearby watercourses. This is further detailed within **Section 8**.

6.12.2 Development will remain outside of the modelled areas of Flood Zone 2 and 3 associated with the Main Rivers, surface water and small watercourses so should not contribute to any displacement of floodwater.

7 PLANNING CONSIDERATIONS AND MITIGATION OPTIONS

7.1 Site layout and design

7.1.1 Flood risk to the Proposed Development has been considered at an early stage in developing the layout and design of the Proposed Development to reduce flood risk within the development, where feasible.

7.1.2 Section 8 of TAN15 (2025) recommends a sequential, risk-based approach should be applied to try to locate more vulnerable land use to areas of lower risk, while more flood-compatible development (less sensitive uses) can be located in higher risk areas. This reflects the core principles of the National Strategy for Flood and Coastal Erosion Risk Management in Wales[20]. No aspects of the Proposed Development are proposed to be located within the areas of Flood Zone 3 associated with Main River or surface water/small watercourse flooding, and a sequential approach has been followed to direct all development to the lowest risk parts of the Site.

7.2 TAN15 consideration

7.2.1 In line with Figure 4 of TAN15 (2026), the development category for '*renewable energy generation facilities (excluding hydro generation)'* is Less Vulnerable Development. In line with Section 11 of TAN15 (2026), Less Vulnerable Development should be flood-free during the 1% river flood (i.e., a flood with a 1 in 100 chance of occurring in any year) and the 0.5 % flood from the sea (i.e., a flood with a 1 in 200 chance of occurring in any year), plus an allowance for climate change over the lifetime of development. It is proven that there is no fluvial or tidal flooding on-site that will impact the Proposed Development, now or in the future. The surface water/small watercourse flood extents with the inclusion of climate change for the lifetime of the development are not expected to impact the site, as it is expected that the flows will remain in-channel and the suitable development buffer from the on-site watercourses will allow any widening of existing floodplains to avoid development. The justification test and acceptability of consequences will not be required for the Site due to its predominant Flood Zone 1 designation with all Proposed Development located outside of the surface water/small watercourse Flood Zones 2 and 3 areas on-site.

7.2.2 To satisfy the criteria of the assessment of flood consequences, the following conditions should be satisfied:

- No increase in flooding elsewhere.
- Occupiers aware of flood risk.

[20] 'The National Strategy for Flood and Coastal Erosion Risk Management in Wales', Welsh Government, October 2020.

- Escape/evacuation routes present.
- Flood emergency plans and procedures agreed and in place.
- Flood resistant and resilient design.
- Acceptable consequences for type of use.

7.3 Modification of ground levels

7.3.1 As the development is located outside of the fluvial and tidal floodplains, there is no requirement from a flood risk perspective to raise components above a designated flood level.

7.3.2 Earthworks are required surrounding the Substation Groundworks in the form of regrading the land are also required for the new tracks, turbines and solar PV development. It is noted that the Proposed Development (**ES Volume IV, Figure 2.1 Proposed Development Layout**) is located within Flood Zone 1 areas and therefore should not displace any floodwater.

7.4 Easements

7.4.1 There are numerous Ordinary Watercourses located on-site which will require a development easement. A minimum easement of 30 m has been incorporated into the development design between the components and the watercourses, with the inclusion of a 15 m easement between the proposed fencing edge and the watercourses. These should be sufficient for access and maintenance of the watercourses.

7.4.2 There are two proposed crossing points of the on-site existing Ordinary Watercourses. Following consultation with NRW during the Environmental Impact Assessment Scoping, NRW has a preference of a clear span bridge for the watercourse crossings, failing that a bottomless arch culvert. If a culvert is required, then an assessment is recommended to be carried out detailing why a culvert was chosen over a clear span bridge. The crossing points have been assessed within **ES Volume III, Appendix 6.1: Watercourse Crossing Baseline Assessment**. The final design of the crossings will be agreed with NRW at detailed design.

7.5 Safe access and egress

7.5.1 There are two proposed access points to the site: one off New Road in the south and the second in the north-east joining the A4063.

7.5.2 The NRW development advice map and flood map for planning indicate the whole of the site is located within Flood Zone 1. As such, safe access and egress can be sought at all times from both access points.

8 SURFACE WATER DRAINAGE STATEMENT

8.1 Scope

8.1.1 This section discusses the potential quantitative effects of the development on both the risk of surface water flooding on-site and elsewhere within the catchment. It also, sets out the surface water drainage strategy for the Proposed Development, and assesses the suitability of SuDS features that could be incorporated as part of the design.

8.1.2 The SuDS Statutory Guidance[21] states that SuDS must be designed and built in accordance with Statutory SuDS Standards[22] published by the Welsh Ministers and SuDS Schemes must be approved by the local authority acting in its SAB role, before construction work begins.

8.1.3 The statutory SuDS Standards contain:

- a set of principles, which in order to obtain SAB approval must be applied in the design of any surface water drainage scheme; and
- six standards, numbered S1 to S6, which deal in turn with:
  - S1 - Runoff destination;
  - S2 - Hydraulic control;
  - S3 - Water quality;
  - S4 - Amenity;
  - S5 – Biodiversity; and
  - S6 - Construction, operation and maintenance.

8.1.4 The use of SuDS is also encouraged by regional and local policy. For the Proposed Development, the local authority acting as the SAB would be both BCBC and NPTC as the Proposed Development lies within catchments located within both of these authority areas.

8.1.5 Schedule 3 to the Flood and Water Management Act 2010 establishes SABs in local authorities. The legislation gives those bodies statutory responsibility for approving and in specified circumstances, adopting the approved drainage systems.

[21] Welsh Government, 'Sustainable Drainage (SuDS) Statutory Guidance', 2019.

[22] Welsh Government, 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems', 2018.

8.1.6 The SAB is established to:

- Evaluate and approve drainage applications for new developments where construction work has drainage implications, and
- Adopt and maintain SuDS schemes, subject to the conditions and exemptions specified in the Flood and Water Management Act 2010.

8.1.7 Additionally, drainage would be designed with consideration of the Building with Nature Standards[23].

8.1.8 The Proposed Development will consist of a solar photovoltaic (PV) generating station and associated panels and infrastructure, wind turbines, substation and associated access tracks. There will be small areas of hardstanding contributed by the Proposed Development from the substation, panel posts, solar transformer bases and wind turbine associated hardstanding. As such, a suitable surface water drainage strategy will be developed to control the additional quantities of runoff entering the nearby watercourses. A Drainage Statement has therefore been developed to assist in the application, with full detailed calculations and drawings being provided at the detailed design stage.

8.2 Pre-development situation

8.2.1 The existing site area is approximately 580 ha and has negligible impermeable areas contributed by existing roads and farm buildings, which will remain unaltered following development.

8.2.2 A comparison between the existing and proposed areas can be seen in **Table 8.1** below. The proposed impermeable area has been based off the proposed turbine hardstandings (19,695 m^2), substation (9,000 m^2), transformers/inverters (527.4 m^2) and access track (77,476 m^2). The existing areas contributed by the existing farm buildings have not been recorded in the calculations, as they will remain unaltered following development.

Table 8.1: Existing and proposed site areas

Land use	Existing area (m^2)	Proposed area (m^2)
Impermeable	0 (0 %)	106,698 (2 %)
Permeable	5,800,000 (100 %)	5,693,302 (98 %)
Total	5,800,000	5,800,000

[23] Building with Nature, Standards Framework, October 2022.

8.2.3 The Institute of Hydrology 124[24] method has been used to estimate the Greenfield surface water runoff for 1 ha of the site, the calculations can be seen in **Table 8.2**. This rate can be pro-rata'd for the proposed impermeable areas at the engineering design stage. Calculations are contained in **Annex E**.

Table 8.2: IOH 124 surface water runoff (greenfield) (per 1.0ha)

Return period	Peak flow (l/s)
QBar	4.6
1 in 1 year	4.0
1 in 30 year	7.8
1 in 100 year	9.6

8.3 Post-development situation

8.3.1 The Proposed Development will result in an increase in impermeable area and surface water runoff across the site. It will therefore be necessary to manage surface water on-site through conveyance towards the proposed point of discharge, whilst providing sufficient attenuation for all events up to the 1 in 100 year event inclusive of 30 % climate change (as a worst-case scenario), in line with 'Flood Consequence Assessments: Climate Change Allowances' guidance and BCBC's data response (**Annex D**).

Point of discharge

8.3.2 Discharge options from the Site have been considered in line with the SuDS hierarchy, as follows.

8.3.3 **Infiltration**

8.3.4 Infiltration should be considered as the primary option to discharge surface water from the developed study area. The effectiveness of infiltration is completely dependent on the physical conditions at the study area. Potential obstacles include:

- Local variations in permeability preventing infiltration - It is understood from the local geology that the Site is situated on an area predominantly absent of superficial deposits, excluding the tributaries of Nany y Gadlys which exhibit deposits of Till and Alluvium. The bedrock geology is recorded as being Mudstone, Siltstone and Sandstone. The exhibited geological strata is generally not considered suitable for the use of soakaways due to its low permeability;

[24] Institute of Hydrology (IoH), 'Flood Estimation for small catchments - Report 124', 1994.

- Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H2 states that these "*should not be built in ground where the water table reaches the bottom of the device at any time of the year*". Groundwater levels should also be confirmed to determine the suitability of infiltration-based SuDS; and
- Source Protection Zones - The study area is not located within a groundwater Source Protection Zone.

8.3.5 Based on available geological data, infiltration-based SuDS are not expected to be viable based on the exhibited bedrock geology that is generally considered to be impermeable, however, this should be confirmed by site-specific infiltration testing.

8.3.6 **Discharge to watercourse**

8.3.7 If infiltration based SuDS are not deemed suitable for a method of surface water disposal in accordance with the results of any infiltration testing, consideration should be given to discharge to watercourse, in line with the drainage hierarchy.

8.3.8 Discharging surface water directly to a local watercourse is considered feasible as there are multiple Ordinary Watercourse networks located across the Site. The Site drains naturally towards these watercourses, and therefore utilising the existing setup will act to mimic the natural scenario.

8.3.9 **Discharge to surface water sewer**

8.3.10 If infiltration based SuDS are not deemed suitable for a method of surface water disposal, consideration would be given to discharge to watercourse, in line with the drainage hierarchy. It is therefore considered that discharge to a surface water sewer is not necessary, due to the availability of other preferable methods.

8.3.11 No existing surface water sewers serve or cross the Site. Any sewers are understood to be located on the perimeter of the Site only.

8.4 Wind Turbine proposed drainage design principles

8.4.1 The wind turbines will contribute surrounding areas of hardstanding in the form of crane pad hardstandings and laydown/storage areas, contributing 3282.5 m^2 per turbine. As such, they will contribute to increased runoff from the Site and will need to be suitably managed.

Storage estimates

8.4.2 To determine whether the proposed SuDS provide sufficient attenuation storage, the WinDes ' 4-Stage Design Guide' tool has been used. The WinDes '4-Stage Design Guide' tool allows for an indicative network to be modelled based upon attenuation feature dimensions, rainfall values and permitted discharge rates, in line with CIRIA guidance. These volumes can be later revised at detail design stage by the introduction of specific flow control methods.

8.4.3 The pro-rata QBar Greenfield runoff rate in relation to the calculations in **Table 8.2**, is 1.52 l/s for the proposed impermeable area of 3282.5 m^2. Calculations have been run using a discharge rate of 2.0 l/s due to this being the minimum practical rate for the hydro-brake outflow device to achieve a self-cleansing velocity, to allow the device to function efficiently. No allowance is included in the calculations for infiltration as a worse-case scenario.

8.4.4 In accordance with a 1.0 m deep attenuation feature, the calculations provide a surface area of 538.9 m^2 and a volume of 399.5 m^3 for Turbines 1-5. Due to the space constraints for Turbine 6, the calculations have been amended to reflect that of an attenuation tank, with a tank depth of 2.4 m, 0.9 m of cover, a surface area of 195 m^2 and a volume of 468.1 m^3. Calculations can be found in **Annex F**.

8.4.5 These volumes can be later revised at detailed design stage by the introduction of specific flow control methods.

8.4.6 The surface water would be captured and managed within an attenuation feature on the downslope side of the turbine hardstanding and would discharge to watercourse via gravity using a flow-control device.

Discharge location

8.4.7 It is intended that surface water runoff from the turbine hardstandings will be discharged to the nearby watercourses to closely mimic the existing greenfield situation. Turbines 1 and 2 will discharge to the on-site section of Nant Gwyn, Turbines 3 and 4 will discharge to the on-site tributary watercourse of Nant Craigyraber, Turbine 5 will discharge to the on-site tributary of Nant Bryncynan and Turbine 6 will discharge off-site to Nant Craigyraber.

8.4.8 **Figures 8.3,** to **8.6** detail the proposed discharge locations, denoted as red stars on the plan, and the surface area covered by the attenuation features. **Figure 8.3** illustrates the strategy for Turbines 1 and 2, **Figure 8.4** details the strategy for Turbine 3 and 4, **Figure 8.5** details the strategy for Turbine 5 and **Figure 8.6** details the strategy for Turbine 6. The exact method of discharge from the proposed detention basins/attenuation features, whether it be piped or via a swale, will be determined at detailed design.

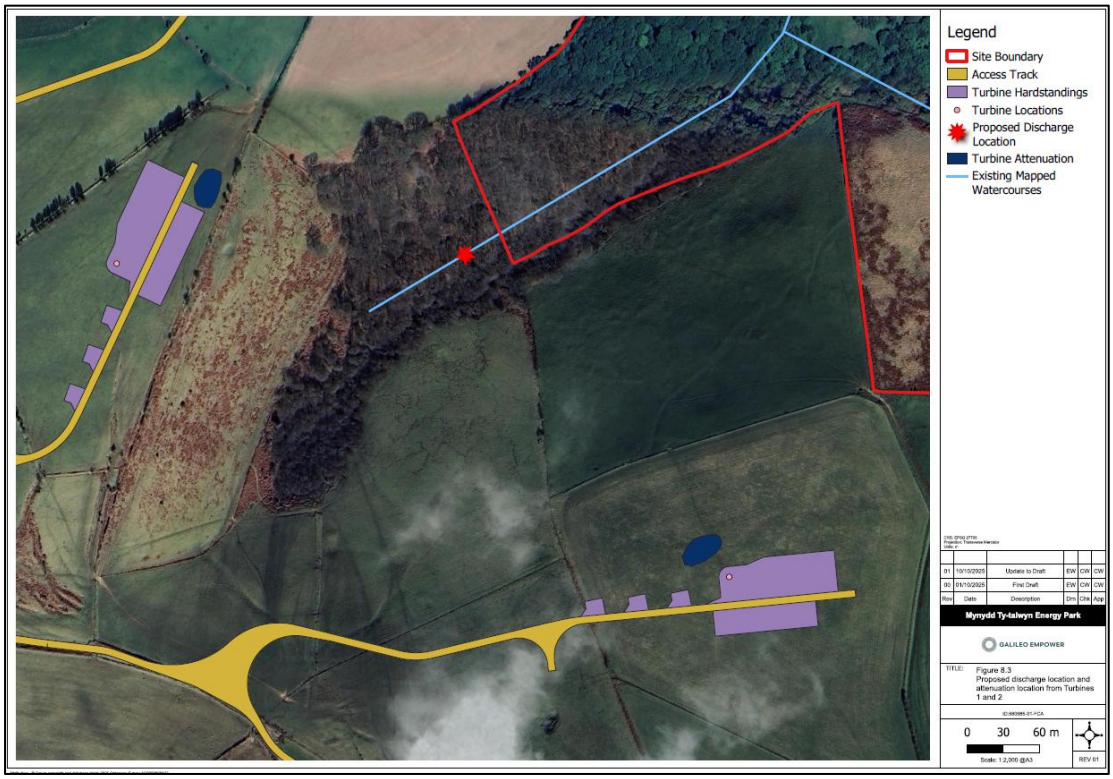


Figure 8.3: Indicative discharge location and attenuation location from Turbines 1 and 2

Figure 8.4: Indicative discharge location and attenuation location from Turbines 3 and 4

Figure 8.5: Indicative discharge location and attenuation location from Turbine 5

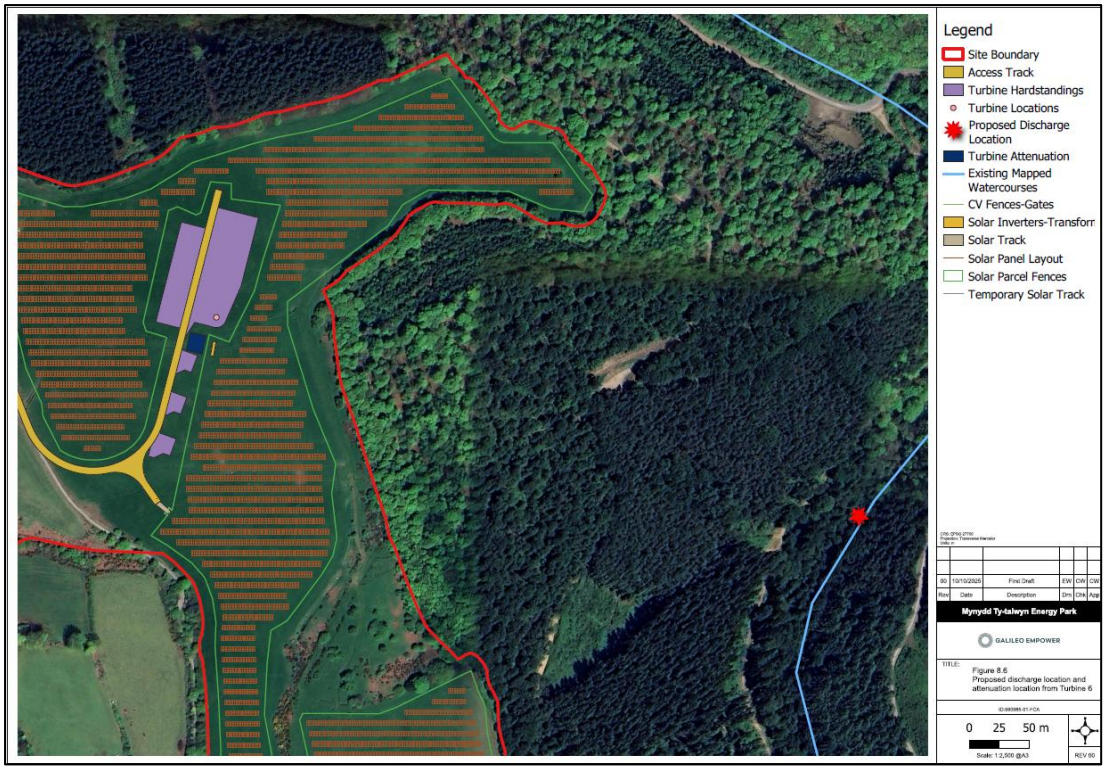


Figure 8.6: Indicative discharge location and attenuation location from Turbine 6

8.4.9 Maintenance of any drainage network is essential to ensure optimal performance of the drainage elements. As such maintenance requirements of the drainage system will include, but not be limited to, the inspection and cleaning of backfilled trenches/swales to ensure that the capacity and infiltration rates are maintained. The frequency of the maintenance requirements would depend on the agreed SuDS incorporated into the surface water drainage design.

8.4.10 The drainage systems are likely to remain in private ownership and therefore the site operator will be responsible for the maintenance of the drainage features on-site.

8.5 Solar PV proposed drainage design principles

8.5.1 Solar arrays

8.5.2 It is anticipated that any precipitation falling on each solar panel will runoff the panels and flow towards/infiltrate in the rain shadow of the down-slope modules. The rows of panels on the Site would be generally aligned from parallel to a 20 ° angle to the contours of the Site. As such rainwater falling of the trailing edge of the panels will generally flow away from the base of the panels between a 90 ° and 20 ° angle towards the rain shadow of the down-slope panels. This feature will enable the use of the rain shadow area of the panels to maintain the infiltration potential of the Site.

8.5.3 In some instances, runoff from solar panels could result in the kinetic compaction of soils at the base of the panels and the intensification of runoff into rivulets running along the trailing edge of the rows of panels. This could conceivably lead to a slight increase in the amount of runoff when compared to the pre-development situation resulting from a decrease in infiltration potential.

8.5.4 The specifications of the solar array supports are to be designed to be widely spaced and are driven vertically into the ground with no additional foundations. The solar PV panels are arranged on mounting frames of varying widths depending on the topography of the ground. The frame is supported at either end by galvanised steel or anodised aluminium poles driven into the ground to a depth of up to 2 m.

8.5.5 The solar PV modules would be separated with a minimum row separation space of 4 m. The spacing between the rows would vary across the Site depending on topography, orientation, minimising effects of overshadowing and to ensure optimal efficiency. The distances used for design work varied from 7.5 m to 13.1 m across the Site. The rows are separated by a horizontal ‘rainwater’ gap. This gap allows rainwater to drain freely to the ground between the panels helping to replicate the Greenfield runoff conditions.

8.5.6 The inclusion of cut off swales along the downslope perimeter of the panel areas can be constructed to ensure that any additional volumes of runoff are captured and managed before discharging to the nearby watercourses. These trenches could be constructed during the construction phase to help manage pollution from silt-laden runoff and can remain constructed for the lifetime of the development.

8.5.7 The proposed drainage principles and design will require to be submitted as part of the SAB application to both BCBC and NPTC.

Vegetation and soil structure

8.5.8 Sustainable management of the post development situation in terms of vegetation planting and soil type can be used as a means of managing surface water runoff from the solar panels. As such, to ensure that there is no increase in surface water runoff, managed sustainable vegetation (with a good soil structure) will be allowed to grow beneath the solar panels, which will avoid kinetic compaction and ensure that any potential instances of rivulet formation are minimised and surface water runoff flows over the ground in a natural way. Vegetation planting and soil management would be site wide to encompass all solar panel rows.

8.6 Transformer/Inverter stations and access track proposed drainage design principles

8.6.1 The access tracks are proposed to be constructed from hardstanding material, with the inverter stations contributing impermeable roofed areas. As such, these components will contribute to increased runoff from the Site and will need to be suitably managed.

8.6.2 It is intended that surface water runoff from the transformer stations and access tracks would be captured within a gravel back-filled drainage trench along the perimeter of the component. This is not considered to be an 'infiltration-based SuDS', however, the trench promotes both infiltration to ground within it and enables on-site attenuation for excess runoff. It is considered that the impermeable areas contributed by the transformers and access tracks will not contribute significant additional volumes of surface water runoff across the site. However, this drainage method ensures that any surface water runoff contributed by the transformers and access tracks will be captured close to their source and the velocity of the runoff from this source reduced if the trench were to overspill, to closely mimic the existing situation.

8.6.3 The design rainfall event for this assessment has been taken as the 6 hour, 1 in 100-year event with the intention of retaining any additional surface water runoff generated as a result of the Proposed Development on the site in the drainage trench. The possible methods of discharging surface water from the Site will be via the existing drainage infrastructure on site or due to the small volumes of runoff, by using natural infiltration/evaporation.

8.6.4 The length of the drainage trench would be determined using the perimeters of the transformer stations and access track. It is intended that test ditches are backfilled with a granular material for health and safety reasons and to allow access.

8.6.5 In accordance with PPW, climate change should be taken into consideration for the lifetime of the development; as such an increase in rainfall of 30 % requires to be included in the storage requirements.

8.6.6 The attenuation volume (m^3) calculated per metre for the hardstanding, should be calculated using a void ratio of 0.3 of the total volume of aggregate in the trench. The trenches will be backfilled with suitably sized and sourced aggregate, to allow appropriate attenuation.

8.6.7 **Figure 8.1** shows the cross-sectional diagram of the proposed infiltration trenches surrounding the transformer stations and access tracks.

8.6.8 The proposed drainage principles and design will require to be submitted as part of the SAB application to both BCBC and NPTC.

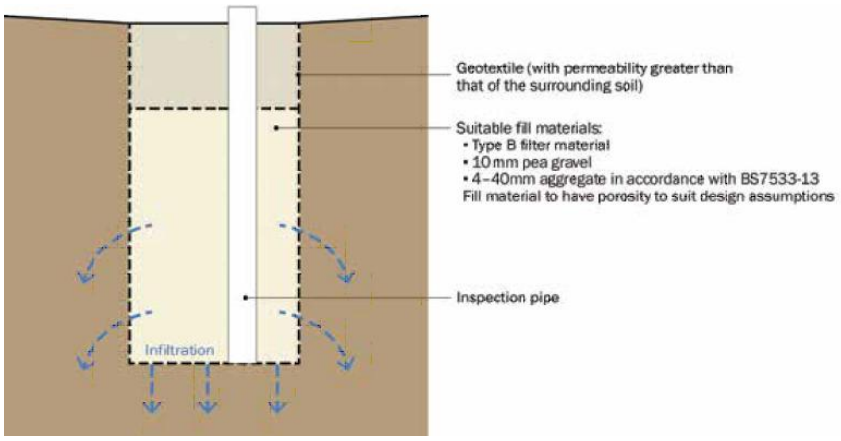


Figure 8.1: Cross-sectional diagram of an infiltration trench (taken from Ciria document C753)

8.7 Substation proposed drainage design principles

8.7.1 The substation is located within the Site's north-western extent and will occupy an area totalling 9,000 m^2 and is considered to be wholly impermeable. As such, it will contribute to increased runoff from the Site and will need to be suitably managed.

Storage estimates

8.7.2 To determine whether the proposed SuDS provide sufficient attenuation storage, the WinDes ' 4-Stage Design Guide' tool has been used. The WinDes '4-Stage Design Guide' tool allows for an indicative network to be modelled based upon attenuation feature dimensions, rainfall values and permitted discharge rates, in line with CIRIA guidance. These volumes can be later revised at detail design stage by the introduction of specific flow control methods.

8.7.3 Calculations have been run using the pro-rata QBar Greenfield runoff rate as a discharge rate, in relation to the calculations in **Table 8.2**, restricting offsite flows to 4.14 l/s. The proposed impermeable area has been calculated as 9,000 m^2. No allowance is included in the calculations for infiltration as a worse-case scenario.

8.7.4 In accordance with a 1.3 m deep attenuation feature, the calculations provide a surface area of 1,272.7 m^2 and a volume of 1282.3 m^3. Calculations can be found in **Annex F**.

8.7.5 These volumes can be later revised at detailed design stage by the introduction of specific flow control methods.

8.7.6 The surface water would be captured and managed within an attenuation feature on the downslope side of the Substation and would discharge to watercourse via gravity using a flow-control device.

Discharge location

8.7.7 It is intended that surface water runoff from the substation will be discharged to the nearby on-site tributary watercourse of Nant Craigyraber to closely mimic the existing greenfield situation.

8.7.8 **Figure 8.2** details the proposed discharge location, denoted as a red star on the plan and the proposed location of the attenuation feature (indicated at this stage as a basin). The exact method of discharge from the proposed detention basin/attenuation feature, whether it be piped or via a swale, will be determined at detailed design.

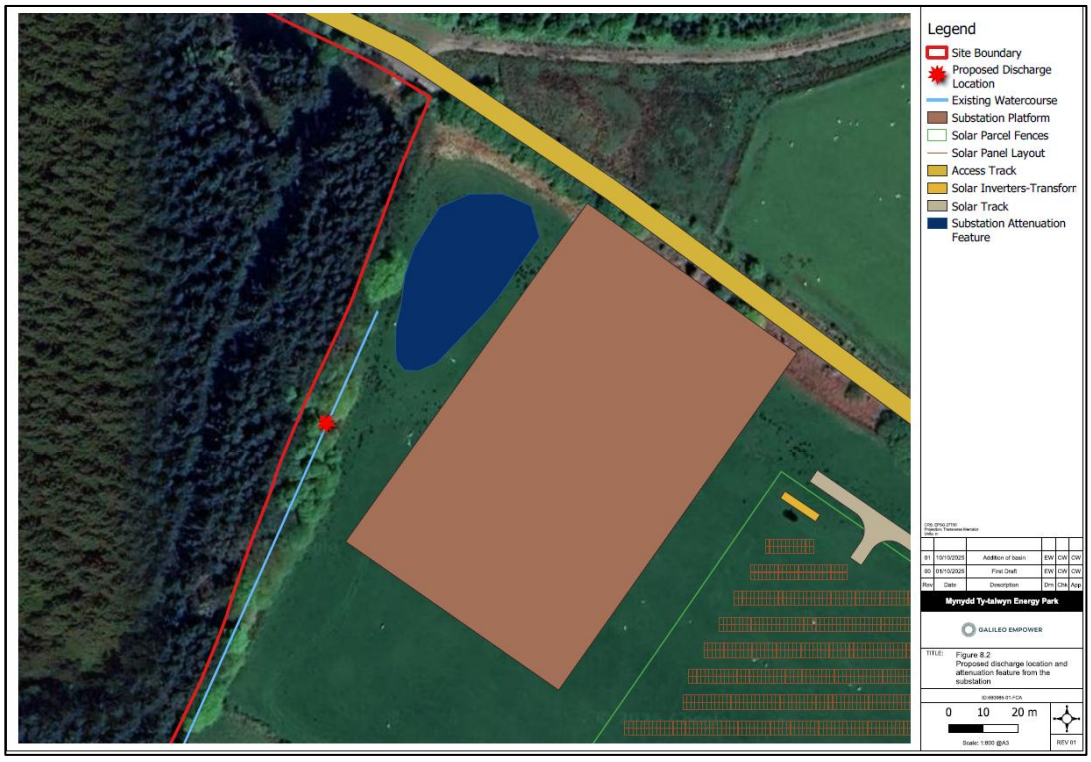


Figure 8.2: Indicative discharge location and attenuation feature from the substation

9 CONCLUSIONS AND RECOMMENDATIONS

9.1.1 This FCA complies with the PPW and its Technical Guidance (TAN15) and demonstrates that flood risk from all sources has been considered in the Proposed Development. It is also consistent with the Local Planning Authority requirements with regards to flood risk.

9.1.2 The Proposed Development is an Energy Park and associated infrastructure and, as such, there will be a negligible increase to the existing impermeable area on-site. The increase in runoff will be suitably managed by the proposed surface water drainage features.

9.1.3 This flood consequence assessment and surface water drainage statement has concluded that:

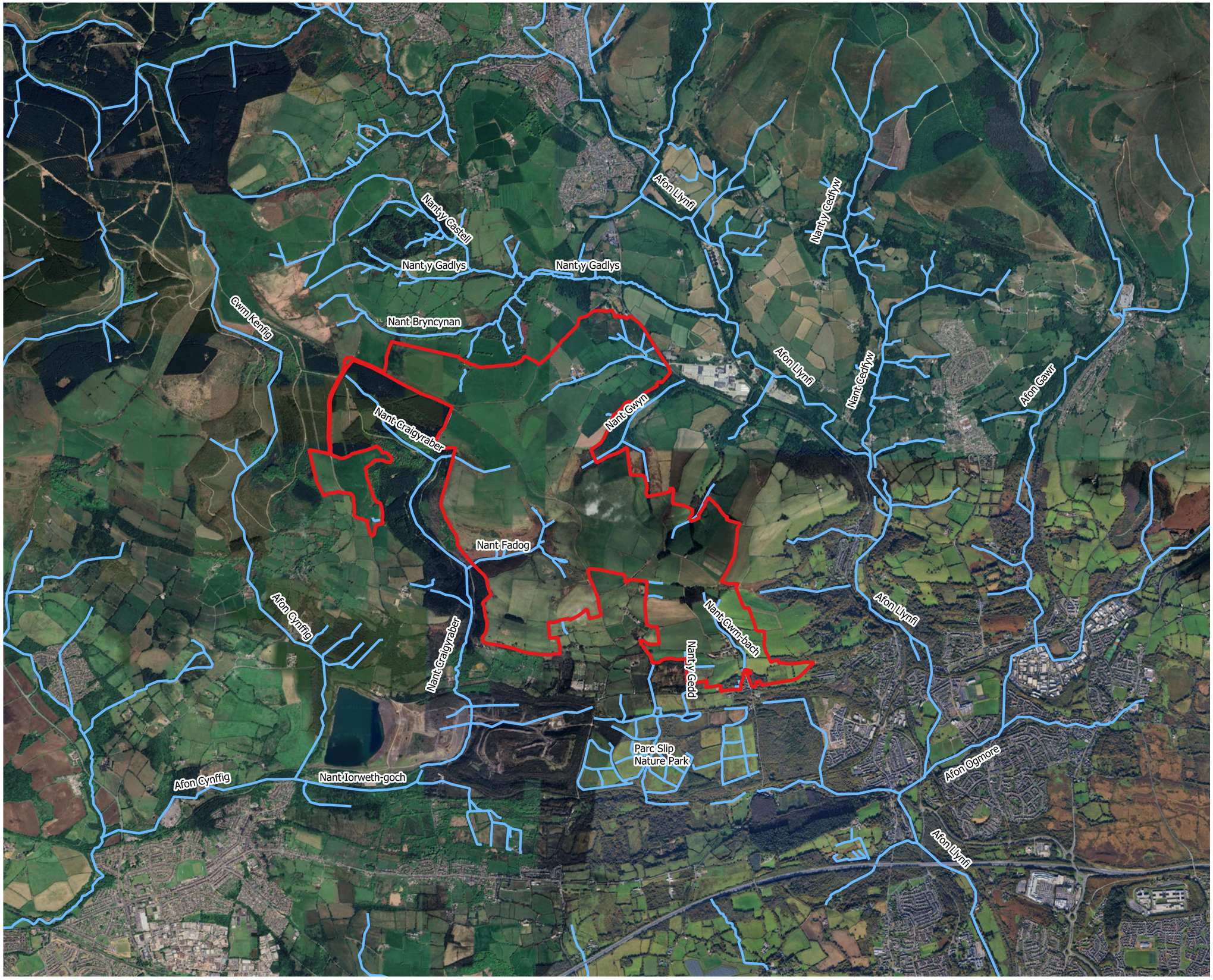
9.1.4 The Site lies within an area designated as a fluvial and tidal Flood Zone 1 in accordance with flood map for planning. The risk to the development from fluvial and tidal flooding is therefore very low;

9.1.5 Flood risk from small watercourses and surface water is very low to the Site, with higher areas of risk associated with the corridors of the Ordinary Watercourses on-site with Proposed Development suitably buffered from these watercourses (15 m minimum);

- Flood risk from other sources – groundwater, sewers, reservoirs and artificial sources – is demonstrated to be very low;
- The development will have minimal to no impact on other forms of flooding;
- Infiltration-based SuDS are not considered suitable method of surface water storage due to the generally impermeable geology on-site. As such, the preferable method of discharge in line with the SuDS hierarchy would be discharge to watercourses. As there are multiple Ordinary Watercourses on-site which the Site naturally falls towards, this is considered to be feasible;
- The additional runoff volumes resulting from the development will be suitably managed using a SuDS strategy; and,
- The FCA does not need to pass the justification test or the acceptable consequences of flooding, due to the Proposed Developments location within Flood Zone 1, in line with TAN15.

9.1.6 Overall, taking into account the above points, the developments at the location outlined should not be precluded on flood risk grounds.

ANNEX A
WATERCOURSE PLAN



Legend

- Site Boundary
- Existing Mapped Watercourses

CRS: EPSG 27700
Projection: Transverse Mercator
Units: m

Rev	Date	Description	Drn	Chk	App
01	26/09/2025	Update to boundary	EW	CW	CW
00	14/04/2025	First Draft	EW	CW	CW

Mynydd Ty-talwyn Energy Park

GALILEO EMPOWER

TITLE:

Annex A
Watercourse Plan

ID:680985-00-K-HYD

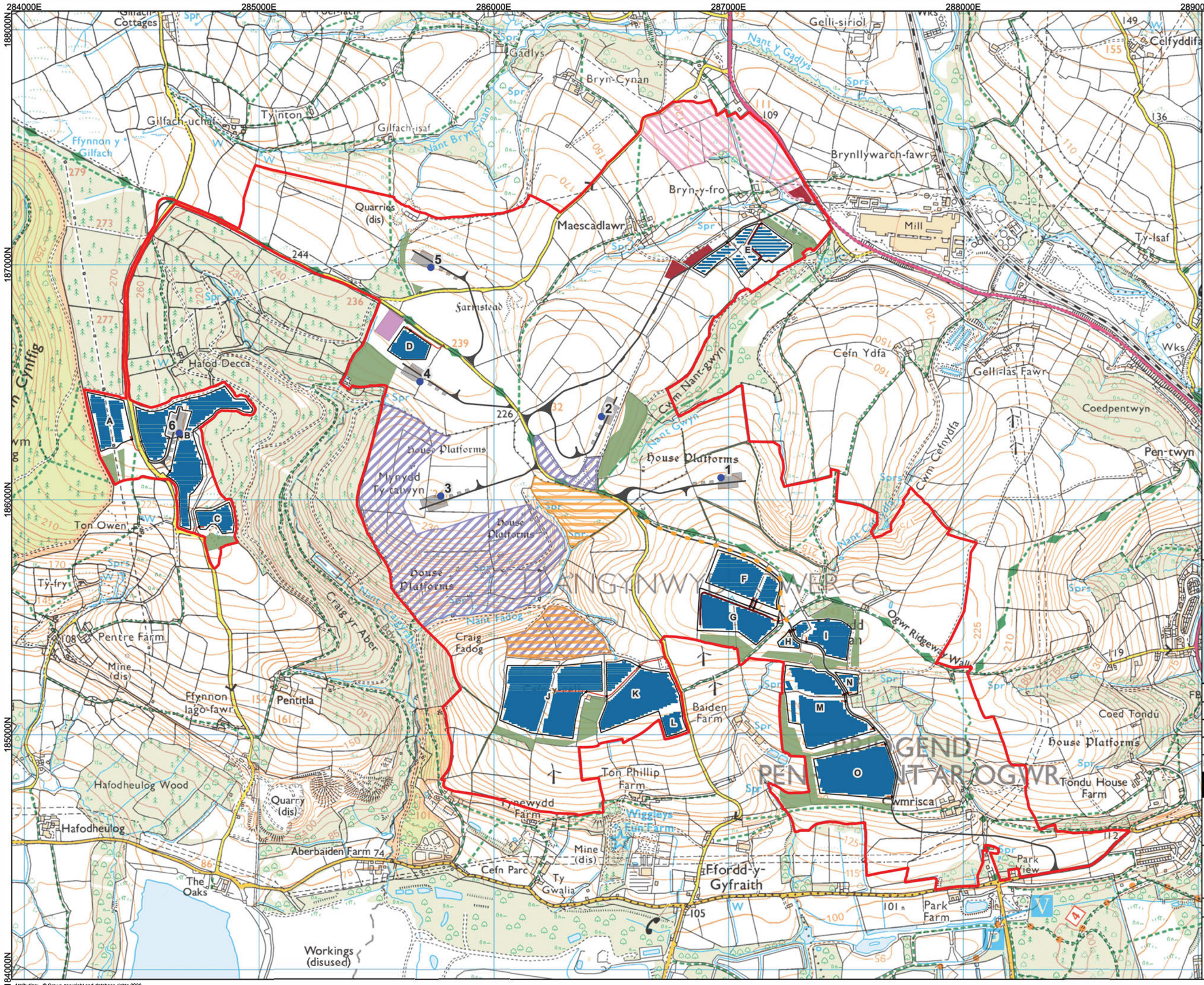
0 0.4 0.8 km

Scale: 1:37,000 @A3

REV 01

Attribution: . © Crown copyright and database rights 2025 Ordnance Survey AC0000808122.

ANNEX B
DEVELOPMENT PLAN



Legend

- Site Boundary
- Turbine Locations (1 - 6)
- Temporary Construction Compounds
- Track Layout and Northern Access Passing Places
- Temporary Track
- Solar Track
- Solar Parcels (A-O) Fencing
- Solar Panels
- Hardstandings
- Substation Platform
- Proposed Permissive Route
- Ecology Mitigation (Birds)
- Ecology Mitigation (Fungi)
- Ecology Mitigation (Marsh Frit)
- Hedgerow Planting
- Woodland Planting

Due to the scale of the layout, the solar Inverters / Transformers are not shown in Figure 2.1 - Proposed Development Layout, however are depicted on insets A to H.

CRS: EPSG:27700
Projection: Transverse Mercator
Ellipsoid: EPSG:7001
Units: meters

Rev	Date	Description	Drn	Chk	App
03	27/03/2026	Amendments to Layout	MD	SP	JB
02	10/09/2025	Amendments to Layout	MD	SP	JB
01	15/04/2025	Amendments to Key	MD	JB	JB
00	12/03/2025	First Draft	MD	JB	JB

Mynydd Ty-talwyn Energy Park

GALILEO EMPOWER

TITLE:

Proposed Development Layout

ID:Fig2.1 Proposed Development Layout Rev03 - (Completeness Check)

0 0.3 0.6 km

Kilometers

Scale: 1:15000 @A3

REV 03

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ANNEX C
NRW CORRESPONDENCE

	Price	What's included	What it can be used for	Software needed	Additional Data
Model Reports and Output (Formerly Products 5 & 6)	Free (OGL)	Modelling Report in a PDF format.	This data can be included in an FCA.	PDF reader such as Adobe Acrobat may be needed. A temporary ShareFile link is added into the email that is sent to Data Distribution.	**Climate Change** - Most of our models include climate change (Q100+20%). From 1st December 2016, Welsh Government Climate Change guidance was updated and regional variations in Climate Change should now be applied; this update has not been included for all of our models. http://gov.wales/topics/planning/policy/policyclarificationletters/2016/cl-03-16climate-change-allowances-for-planningpurposes/?lang=en **Breach & Blockage** – Some models include breach and blockage data which can be supplied where relevant. **Wave Overtopping-** For Coastal and Estuarine sites NRW will require assessment of wave overtopping. It is up to the developer to justify why an assessment isn't required. **Rate of Rise & Speed of Inundation** – Most models will have this information in the form of a hydrograph and animation at the site of interest. The above data can be requested from Data Distribution. If the model does not include the data, you will need to obtain a Product 7 to re-run and alter the model to obtain the data necessary.
	Free (OGL)	This product provides the GIS outputs and Raw output data from the model. This will include depth, height, velocity and hazard grids in their raw format (2D models). Or 1D cross-section flow and stage data in excel format (1D models). The result is not site specific.	This data can be used in an FCA. It must be analysed on appropriate GIS software and formatted correctly for use.	The software required depends upon the product used. GIS software such as QGIS, Map info or ArcMap will be needed to analyse the cross-sections or ASCII girds. A spreadsheet software such as Excel can also be used.A temporary ShareFile link is added into the email that is sent to Data Distribution.	
Model Build Information (Formerly Product 7)	£150 +VAT (Special Licence)	This is the full 1D/2D model. It includes the most recent model version, survey, hydrology and all supporting data. You will be able to re-run the model and add information to the model if necessary.	This product can be used for FCAs planning developments with added mitigation or improvements to the model. The results can be analysed and summarised into a clear format and be included in an FCA.	The software required depends on the type of model used. Most of our models are ISIS (FMP)-TuFLOW, other models include HECRAS and Estry TuFLOW. Other types of software needed are QGIS, Map info or ArcMap to analyse the ASCII grids and cross sections. Also, Microsoft Excel will be useful. A temporary ShareFile link is added into the email that is sent to Data Distribution.	

* Please be aware that each data request has a standard turnaround time of 20 working days. Therefore, the choice of product should be looked at in detail to avoid duplicate requests. For example, if you choose to receive the Model Reports and Output Product and then subsequently decide the Model Build Information Product would be more suitable, please note that this will be logged as a separate request and could take another 20 working days to be processed and responded to.

Please Note: All information supplied will need to be verified by the recipient PRIOR to using in a Flood Consequences Assessment (FCA). We would expect to see a review of hydrology, in-channel survey, floodplain topography etc. to demonstrate the data is suitable for the purposes of producing an FCA.

- Risk of flooding maps from our website, maps can be printed to PDF - https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en
- Flood data on Lle including Historic Flood Outlines http://lle.gov.wales/Catalogue?lang=en&text=flood
- Extreme Tide Levels can be downloaded from http://lle.gov.wales/catalogue/item/CoastalDesignExtremeSeaLevels/?lang=en

From: Data Distribution
To: [redacted]
Subject: ATI 25677a - Flood Information Request - Mynydd Ty Talwyn
Date: 02 August 2023 09:12:54
Attachments: image002.png

CAUTION: This email originated from outside the Organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hello Emma

Your data request has been logged with the above reference.

Unfortunately, the flood map in this area is based on a nationally generated Flood Risk Assessment Wales (FRAW) model, this was last updated in 2020. FRAW modelling uses LIDAR data to generate flood outlines with assumptions made about the channel capacity. This modelling was carried out for the production of flood extents only and is not suitable for detailed site specific assessments, therefore we are not able to provide any flood products for your site.

Regards

Kathy Banner
Swyddog Trwyddedu Data / Data Licensing Officer
Cyswllt Cyfoeth / Customer Hub
Ffôn/Phone: [redacted]
Symudul / Mobile: [redacted]
Dyddiau gweithio / Working day: Tues - Thurs
Hi Hithau / She Her

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: Data Distribution
Sent: 24 July 2023 13:57
To: Emma Walker [redacted]
Subject: RE: Flood Information Request - Mynydd Ty Talwyn 680985

Dear Ms Walker,

Thank you for your email concerning the above and taking your requests in turn, please see below:

- Information on the recently published climate change guidance for this area - Welsh Government climate change allowances and flood consequence assessments.
- Information on surface water flood risk including flow pathways and depths – Please contact the relevant Local Authority for this information, as it falls within their remit.
- Information on historic flooding from all sources – Please see this link - Recorded Flood Extents | DataMapWales (gov.wales)
- Any data on existing surface water discharges to the surrounding watercourse or sewers - Consented Discharges to Controlled Waters with Conditions | DataMapWales (gov.wales)
- Any data on groundwater flooding – Unfortunately we don't hold records on instances of groundwater flooding. Please contact the relevant council as the Lead Local Flood Authority on mitigating risk from groundwater flooding in it's area.
- Any information on reservoir flooding – Please see this link - Data catalogue | DataMapWales (gov.wales)
- Any information on culverted watercourses or privates sewers which you know of which do not show up on the public sewer records – We have the following links but please also check with the relevant Local Authority –

Natural Resources Wales / Find flood defence structures near you (The National Flood Asset Database)
Areas Benefiting from Flood Defences | DataMapWales (gov.wales)
Flood Defence Structures | DataMapWales (gov.wales)

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

Please see the following links:

Natural Resources Wales / Sustainable Drainage Systems (SuDS)
Natural Resources Wales / Our service to developers
Natural Resources Wales / Contact us about a planning enquiry

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.

I trust that this is of use to you.

Yours sincerely,

Enw / Name Michelle Lewis
Teitl swydd / Job title Data Licensing Officer
Adran / Department Customer, Communications and Commercial

From: Emma Walker [redacted]
Sent: 21 July 2023 16:02
To: Data Distribution [redacted]
Subject: Flood Information Request - Mynydd Ty Talwyn 680985

> **Rhybudd:** Deilliodd yr e-bost hwn o'r tu allan i'r sefydliad. Peidiwch â chlicio dolenni nac atodiadau agored oni bai eich bod yn cydnabod yr anfonwr ac yn gwybod bod y cynnwys yn ddiogel.
>
> **Caution:** This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear Sir/Madam,

Please could I order information on flooding and drainage for the following site in order to inform a Flood Risk Assessment:

Baiden Farm,
Ffordd-y-Gyfraith,
Llangynwyd Lower,
Bridgend County,
CF32 0BS (Nearest)

Eastings 287105 , Northings 185674

I would like all the flooding information and advice you have including the following, if available:

Information on the recently published climate change guidance for this area,
Information on surface water flood risk including flow pathways and depths,
Information on historic flooding from all sources,
Any data on existing surface water discharges to the surrounding watercourse or sewers,
Any data on groundwater flooding,
Any information on reservoir flooding; and,
Any information on culverted watercourses or privates sewers which you know of which do not show up on the public sewer records.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

We have a relatively quick turn around on this project and would therefore appreciate a quick response.

If you have any queries please don't hesitate to contact me.

Kind regards,
Emma Walker BSc (Hons)
Hydrologist
LinkedIn

LDE
CIVILS | STRUCTURES | HYDROLOGY
an RSK company

www.rsklde.com
14 Beecham Court, Pemberton Business Park, Wigan, WN3 6PR, UK
[redacted]

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ANNEX D
BRIDGEND COUNTY BOROUGH COUNCIL CORRESPONDENCE

From: [redacted]
To:
Cc: Planning
Subject: RE: Flood Information Request - Mynydd Ty Talwyn 680985
Date: 04 August 2023 14:35:21

CAUTION: This email originated from outside the Organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

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

Drainage

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

Flood Risk

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

Best regards

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

[redacted]
Gwefan / Website: www.bridgend.gov.uk

From: Planning [redacted]
Sent: 31 July 2023 12:32
To: [redacted]
Cc: landdrainage [redacted]
Subject: FW: Flood Information Request - Mynydd Ty Talwyn 680985

Good Afternoon,

Please refer your enquiry to NRW and we will also send this email to our Land Drainage section within BCBC.

Regards

Planning Dept.

From: Emma Walker < >
Sent: 21 July 2023 16:21
To: Planning [redacted]
Subject: Flood Information Request - Mynydd Ty Talwyn 680985

Dear Sir/Madam,

Please could I order information on flooding and drainage for the following site in order to inform a Flood Risk Assessment:

Baiden Farm,
Ffordd-y-Gyfraith,
Llangynwyd Lower,
Bridgend County,
CF32 0BS (Nearest)

Eastings 287105 , Northings 185674

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Information on surface water flood risk including flow pathways and depths,
Information on historic flooding from all sources,
Any data on existing surface water discharges to the surrounding watercourse or sewers,
Any data on groundwater flooding,
Any information on reservoir flooding; and,
Any information on culverted watercourses or private sewers which you know of which do not show up on the public sewer records.

Finally, please could you provide any recommendation on how the surface water is to be managed; for example, restrictions in discharge rates the requirements for SuDS, possible discharge locations and attenuation requirements?

We have a relatively quick turn around on this project and would therefore appreciate a quick response.

If you have any queries please don't hesitate to contact me.

Kind Regards,
Emma Walker BSc (Hons)
Hydrologist
LinkedIn

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an RSK company
www.rsklde.com

14 Beecham Court, Pemberton Business Park, Wigan, WN3 6PR, UK
[redacted]

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This e-mail and any attachments have been scanned.

Mae'r e-bost hwn ac unrhyw atodiadau a drosglwyddir gydag ef yn cynrychioli safbwyntiau'r unigolyn a'i anfonodd (unigolion a'u hanfonodd) ac ni ddylid eu hystyried fel safbwynt swyddogol Cyngor Bwrdeistref Sirol Pen-y-bont ar Ogwr. Mae'r cynnwys yn gyfrinachol ac wedi'i fwriadu ar gyfer y sawl y'i cyfeiriwyd ato yn unig. Os ydych wedi ei dderbyn mewn camgymeriad, rhowch wybod i weinyddwr y system ar postmaster@bridgend.gov.uk

Mae'r e-bost hwn ac unrhyw atodiadau wedi cael eu sganio.

ANNEX E
GREENFIELD RUNOFF ESTIMATION

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Emma Walker
Site name:	MTT
Site location:	MTT

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

Site Details

Latitude:	51.55787° N
Longitude:	3.63622° W
Reference:	3546925262
Date:	Feb 14 2025 15:37

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm):	1444	1444
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	6.7	6.7
1 in 1 year (l/s):	5.9	5.9
1 in 30 years (l/s):	11.93	11.93
1 in 100 year (l/s):	14.61	14.61
1 in 200 years (l/s):	16.49	16.49

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.

ANNEX F
QUICKSTORE ESTIMATIONS (SUBSTATION AND WIND TURBINE)

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	232.717	0.217	2.5	226.7	O K
30 min Summer	232.808	0.308	2.5	328.2	O K
60 min Summer	232.915	0.415	2.7	454.0	O K
120 min Summer	233.033	0.533	3.0	597.8	O K
180 min Summer	233.099	0.599	3.2	682.4	O K
240 min Summer	233.149	0.649	3.3	746.9	O K
360 min Summer	233.220	0.720	3.5	841.3	Flood Risk
480 min Summer	233.270	0.770	3.6	909.1	Flood Risk
600 min Summer	233.307	0.807	3.7	961.0	Flood Risk
720 min Summer	233.337	0.837	3.8	1002.1	Flood Risk
960 min Summer	233.380	0.880	3.9	1062.7	Flood Risk
1440 min Summer	233.428	0.928	4.0	1132.9	Flood Risk
2160 min Summer	233.459	0.959	4.1	1177.8	Flood Risk
2880 min Summer	233.475	0.975	4.1	1201.0	Flood Risk
4320 min Summer	233.491	0.991	4.1	1224.7	Flood Risk
5760 min Summer	233.497	0.997	4.1	1233.1	Flood Risk
7200 min Summer	233.498	0.998	4.1	1234.6	Flood Risk
8640 min Summer	233.497	0.997	4.1	1233.1	Flood Risk
10080 min Summer	233.495	0.995	4.1	1230.3	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	101.849	27
30 min Summer	73.840	42
60 min Summer	51.304	72
120 min Summer	34.105	130
180 min Summer	26.198	190
240 min Summer	21.700	250
360 min Summer	16.574	368
480 min Summer	13.652	488
600 min Summer	11.726	608
720 min Summer	10.346	726
960 min Summer	8.476	966
1440 min Summer	6.375	1442
2160 min Summer	4.792	2096
2880 min Summer	3.918	2420
4320 min Summer	2.957	3196
5760 min Summer	2.431	3992
7200 min Summer	2.095	4832
8640 min Summer	1.861	5704
10080 min Summer	1.687	6552

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	232.717	0.217	2.5	226.7	O K
30 min Winter	232.808	0.308	2.5	328.3	O K
60 min Winter	232.915	0.415	2.7	454.1	O K
120 min Winter	233.033	0.533	3.0	598.1	O K
180 min Winter	233.100	0.600	3.2	682.8	O K
240 min Winter	233.149	0.649	3.3	747.6	O K
360 min Winter	233.221	0.721	3.5	842.5	Flood Risk
480 min Winter	233.271	0.771	3.6	910.8	Flood Risk
600 min Winter	233.309	0.809	3.7	963.2	Flood Risk
720 min Winter	233.339	0.839	3.8	1004.9	Flood Risk
960 min Winter	233.382	0.882	3.9	1066.7	Flood Risk
1440 min Winter	233.433	0.933	4.0	1139.9	Flood Risk
2160 min Winter	233.468	0.968	4.1	1190.7	Flood Risk
2880 min Winter	233.480	0.980	4.1	1208.9	Flood Risk
4320 min Winter	233.491	0.991	4.1	1224.6	Flood Risk
5760 min Winter	233.489	0.989	4.1	1222.5	Flood Risk
7200 min Winter	233.481	0.981	4.1	1210.6	Flood Risk
8640 min Winter	233.471	0.971	4.1	1194.8	Flood Risk
10080 min Winter	233.459	0.959	4.1	1177.3	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	101.849	27
30 min Winter	73.840	41
60 min Winter	51.304	70
120 min Winter	34.105	128
180 min Winter	26.198	188
240 min Winter	21.700	246
360 min Winter	16.574	362
480 min Winter	13.652	480
600 min Winter	11.726	596
720 min Winter	10.346	714
960 min Winter	8.476	944
1440 min Winter	6.375	1400
2160 min Winter	4.792	2060
2880 min Winter	3.918	2656
4320 min Winter	2.957	3328
5760 min Winter	2.431	4264
7200 min Winter	2.095	5192
8640 min Winter	1.861	6128
10080 min Winter	1.687	6968

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.224	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.900

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.300	4-8	0.300	8-12	0.300

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Model Details

Storage is Online Cover Level (m) 233.500

Tank or Pond Structure

Invert Level (m) 232.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	990.0	1.000	1486.4

Hydro-Brake® Outflow Control

Design Head (m) 1.000 Diameter (mm) 83
Design Flow (l/s) 4.1 Invert Level (m) 232.500
Hydro-Brake® Type Md5 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	4.5	3.000	7.2	7.000	11.0
0.200	2.5	1.400	4.9	3.500	7.8	7.500	11.4
0.300	2.5	1.600	5.2	4.000	8.3	8.000	11.7
0.400	2.7	1.800	5.6	4.500	8.8	8.500	12.1
0.500	2.9	2.000	5.9	5.000	9.3	9.000	12.4
0.600	3.2	2.200	6.1	5.500	9.7	9.500	12.8
0.800	3.7	2.400	6.4	6.000	10.2		
1.000	4.1	2.600	6.7	6.500	10.6		

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.277	0.277	1.1	82.6	O K
30 min Summer	0.381	0.381	1.3	119.4	O K
60 min Summer	0.500	0.500	1.4	164.7	O K
120 min Summer	0.622	0.622	1.6	215.9	O K
180 min Summer	0.689	0.689	1.7	245.3	O K
240 min Summer	0.737	0.737	1.7	267.5	Flood Risk
360 min Summer	0.804	0.804	1.8	299.1	Flood Risk
480 min Summer	0.849	0.849	1.9	321.0	Flood Risk
600 min Summer	0.881	0.881	1.9	337.1	Flood Risk
720 min Summer	0.905	0.905	1.9	349.3	Flood Risk
960 min Summer	0.937	0.937	2.0	365.8	Flood Risk
1440 min Summer	0.965	0.965	2.0	380.6	Flood Risk
2160 min Summer	0.982	0.982	2.0	389.8	Flood Risk
2880 min Summer	0.989	0.989	2.0	393.7	Flood Risk
4320 min Summer	0.988	0.988	2.0	393.2	Flood Risk
5760 min Summer	0.979	0.979	2.0	388.2	Flood Risk
7200 min Summer	0.968	0.968	2.0	382.5	Flood Risk
8640 min Summer	0.958	0.958	2.0	376.9	Flood Risk
10080 min Summer	0.947	0.947	2.0	371.4	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	101.849	27
30 min Summer	73.840	41
60 min Summer	51.304	70
120 min Summer	34.105	130
180 min Summer	26.198	190
240 min Summer	21.700	248
360 min Summer	16.574	368
480 min Summer	13.652	486
600 min Summer	11.726	606
720 min Summer	10.346	724
960 min Summer	8.476	962
1440 min Summer	6.375	1378
2160 min Summer	4.792	1732
2880 min Summer	3.918	2112
4320 min Summer	2.957	2944
5760 min Summer	2.431	3800
7200 min Summer	2.095	4616
8640 min Summer	1.861	5448
10080 min Summer	1.687	6256

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	0.277	0.277	1.1	82.6	O K
30 min Winter	0.381	0.381	1.3	119.4	O K
60 min Winter	0.500	0.500	1.4	164.8	O K
120 min Winter	0.623	0.623	1.6	216.1	O K
180 min Winter	0.690	0.690	1.7	245.7	O K
240 min Winter	0.738	0.738	1.7	268.0	Flood Risk
360 min Winter	0.805	0.805	1.8	299.9	Flood Risk
480 min Winter	0.851	0.851	1.9	322.0	Flood Risk
600 min Winter	0.883	0.883	1.9	338.4	Flood Risk
720 min Winter	0.908	0.908	1.9	350.9	Flood Risk
960 min Winter	0.941	0.941	2.0	368.1	Flood Risk
1440 min Winter	0.972	0.972	2.0	384.6	Flood Risk
2160 min Winter	0.984	0.984	2.0	390.7	Flood Risk
2880 min Winter	0.988	0.988	2.0	393.3	Flood Risk
4320 min Winter	0.977	0.977	2.0	387.0	Flood Risk
5760 min Winter	0.954	0.954	2.0	375.1	Flood Risk
7200 min Winter	0.929	0.929	2.0	362.1	Flood Risk
8640 min Winter	0.905	0.905	1.9	349.6	Flood Risk
10080 min Winter	0.882	0.882	1.9	337.6	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	101.849	26
30 min Winter	73.840	41
60 min Winter	51.304	70
120 min Winter	34.105	128
180 min Winter	26.198	186
240 min Winter	21.700	244
360 min Winter	16.574	360
480 min Winter	13.652	478
600 min Winter	11.726	594
720 min Winter	10.346	708
960 min Winter	8.476	934
1440 min Winter	6.375	1374
2160 min Winter	4.792	1772
2880 min Winter	3.918	2220
4320 min Winter	2.957	3156
5760 min Winter	2.431	4048
7200 min Winter	2.095	4968
8640 min Winter	1.861	5800
10080 min Winter	1.687	6664

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.224	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.329

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.110	4-8	0.110	8-12	0.110

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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	260.0	1.000	538.9

Hydro-Brake® Outflow Control

Design Head (m) 1.000 Diameter (mm) 58
Design Flow (l/s) 2.0 Invert Level (m) 0.000
Hydro-Brake® Type Md5 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	1.200	2.2	3.000	3.5	7.000	5.4
0.200	1.0	1.400	2.4	3.500	3.8	7.500	5.5
0.300	1.1	1.600	2.6	4.000	4.0	8.000	5.7
0.400	1.3	1.800	2.7	4.500	4.3	8.500	5.9
0.500	1.4	2.000	2.9	5.000	4.5	9.000	6.1
0.600	1.6	2.200	3.0	5.500	4.7	9.500	6.2
0.800	1.8	2.400	3.1	6.000	5.0		
1.000	2.0	2.600	3.3	6.500	5.2		

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.426	0.426	0.7	83.0	O K
30 min Summer	0.616	0.616	0.9	120.1	O K
60 min Summer	0.851	0.851	1.0	166.0	O K
120 min Summer	1.120	1.120	1.2	218.5	O K
180 min Summer	1.278	1.278	1.3	249.3	O K
240 min Summer	1.399	1.399	1.3	272.8	O K
360 min Summer	1.575	1.575	1.4	307.2	O K
480 min Summer	1.701	1.701	1.5	331.7	O K
600 min Summer	1.797	1.797	1.5	350.5	O K
720 min Summer	1.873	1.873	1.5	365.2	O K
960 min Summer	1.984	1.984	1.6	386.8	O K
1440 min Summer	2.109	2.109	1.6	411.2	O K
2160 min Summer	2.190	2.190	1.6	427.1	O K
2880 min Summer	2.242	2.242	1.7	437.1	O K
4320 min Summer	2.297	2.297	1.7	448.0	O K
5760 min Summer	2.320	2.320	1.7	452.4	O K
7200 min Summer	2.325	2.325	1.7	453.4	O K
8640 min Summer	2.322	2.322	1.7	452.9	O K
10080 min Summer	2.315	2.315	1.7	451.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	101.849	27
30 min Summer	73.840	42
60 min Summer	51.304	72
120 min Summer	34.105	130
180 min Summer	26.198	190
240 min Summer	21.700	250
360 min Summer	16.574	368
480 min Summer	13.652	488
600 min Summer	11.726	606
720 min Summer	10.346	726
960 min Summer	8.476	964
1440 min Summer	6.375	1442
2160 min Summer	4.792	1928
2880 min Summer	3.918	2284
4320 min Summer	2.957	3072
5760 min Summer	2.431	3920
7200 min Summer	2.095	4760
8640 min Summer	1.861	5544
10080 min Summer	1.687	6448

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	0.426	0.426	0.7	83.0	O K
30 min Winter	0.616	0.616	0.9	120.1	O K
60 min Winter	0.851	0.851	1.0	166.0	O K
120 min Winter	1.121	1.121	1.2	218.6	O K
180 min Winter	1.280	1.280	1.3	249.5	O K
240 min Winter	1.401	1.401	1.3	273.1	O K
360 min Winter	1.578	1.578	1.4	307.6	O K
480 min Winter	1.704	1.704	1.5	332.4	O K
600 min Winter	1.801	1.801	1.5	351.3	O K
720 min Winter	1.878	1.878	1.5	366.2	O K
960 min Winter	1.991	1.991	1.6	388.3	O K
1440 min Winter	2.122	2.122	1.6	413.8	O K
2160 min Winter	2.209	2.209	1.7	430.7	O K
2880 min Winter	2.244	2.244	1.7	437.5	O K
4320 min Winter	2.283	2.283	1.7	445.1	O K
5760 min Winter	2.279	2.279	1.7	444.4	O K
7200 min Winter	2.256	2.256	1.7	439.9	O K
8640 min Winter	2.225	2.225	1.7	433.8	O K
10080 min Winter	2.189	2.189	1.6	426.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	101.849	27
30 min Winter	73.840	41
60 min Winter	51.304	70
120 min Winter	34.105	128
180 min Winter	26.198	186
240 min Winter	21.700	246
360 min Winter	16.574	362
480 min Winter	13.652	480
600 min Winter	11.726	596
720 min Winter	10.346	712
960 min Winter	8.476	942
1440 min Winter	6.375	1392
2160 min Winter	4.792	2036
2880 min Winter	3.918	2340
4320 min Winter	2.957	3248
5760 min Winter	2.431	4168
7200 min Winter	2.095	5112
8640 min Winter	1.861	5968
10080 min Winter	1.687	6864

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.224	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.329

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.110	4-8	0.110	8-12	0.110

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Model Details

Storage is Online Cover Level (m) 3.300

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	195.0	2.401	0.0	3.301	0.0		
2.400	195.0	3.300	0.0				

Hydro-Brake® Outflow Control

Design Head (m) 3.300 Diameter (mm) 43
Design Flow (l/s) 2.0 Invert Level (m) 0.000
Hydro-Brake® Type Md5 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.5	1.200	1.2	3.000	1.9	7.000	2.9
0.200	0.5	1.400	1.3	3.500	2.1	7.500	3.0
0.300	0.6	1.600	1.4	4.000	2.2	8.000	3.1
0.400	0.7	1.800	1.5	4.500	2.4	8.500	3.2
0.500	0.8	2.000	1.6	5.000	2.5	9.000	3.3
0.600	0.9	2.200	1.7	5.500	2.6	9.500	3.4
0.800	1.0	2.400	1.7	6.000	2.7		
1.000	1.1	2.600	1.8	6.500	2.8		

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