



Foel Fach Wind Farm Limited.

Foel Fach Wind Farm - Environmental Statement Volume III

Appendix 7.2: Watercourse Crossing Schedule

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RSK GENERAL NOTES

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Author	Abigail Hudson Vanja Krage	Technical reviewer	Catherine Isherwood
Date:	13/06/25	Date:	19/06/2025
Project manager	Catherine Isherwood		
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EXECUTIVE SUMMARY

A Watercourse Crossing Schedule has been prepared for the Proposed Development to address the requirements for new watercourse crossing structures situated along proposed access tracks. Proposed crossings were assessed using a catchment-based approach, through use of desk study and walkover surveys, to identify crossing locations within the Application Site. Three watercourse crossings have been identified and their location, characteristics and recommendations of crossing types outlined. Proposed crossing structures are open-bottomed culverts or bridge structures as these provide the best flow conveyance for higher water levels as well as protecting channel beds and habitats along the watercourses.

1 INTRODUCTION

1.1 Introduction

- 1.1.1 This report provides a Watercourse Crossing Schedule for Foel Fach Wind Farm and associated infrastructure, hereafter referred to as the 'Proposed Development'.
- 1.1.2 The report forms an Appendix to the Environmental Statement (ES) for the Proposed Development and should be read in conjunction with the **ES Volume II, Chapter 7 Land, Soils, and Water**. It has been produced to address the requirement for new watercourse crossing structures for the Proposed Development.
- 1.1.3 Watercourse crossings are closely associated with Site drainage, and this document should be read in conjunction with **ES Volume III, Appendix 7.1: Flood Consequences Assessment** and **ES Volume III, Appendix 7.3: Water Framework Directive Assessment**. Flood consequence and watercourse crossings are interlinked and important to understand, as both have the potential to cause significant environmental effects, should they not be adequately addressed.
- 1.1.4 Watercourse crossings will be required on the proposed access track for the Proposed Development. This document provides the rationale for their need within the Proposed Development, as well as background descriptions of the watercourse crossing locations and the process of layout design. It also provides sufficient background information to support future applications for authorisation under the Water Environment Regulations 2017 (UK Government, 2017).

1.2 Location

- 1.2.1 The Application Site ('Site) is located within the administrative boundary of Gwynedd Council, North Wales, approximately 3.1 kilometres (km) north of Bala. Eryri National Park is situated to the west of the Site, with the nearest turbine (T01) located approximately 1.9 km east of the national park boundary. The Site elevation varies from approximately 225 metres (m) above Ordnance Datum (AOD) to approximately 550 m AOD. The majority of the Site is located on an area of grazing moorland with a number of parcels of registered common land. Two registered common land parcels are located in the eastern area of the Site. The majority of the land within the Site is Countryside and Rights of Way Open Access land, with areas of agricultural land. A number of Public Rights of Way (PRoW) are present within and adjacent to the Site, although none are nationally designated trails. Small, wooded areas are present within the Site. Ancient woodland and larger areas of forestry are present outside the application boundary, to the south.

1.3 Development Proposals

1.3.1 The Proposed Development would include:

- 10 no. three bladed horizontal axis wind turbines, up to 200 or 220 metres in height to the blade tip (where specified)
- wind turbine foundations and hardstanding areas which will include crane pad hardstanding areas and laydown/storage areas
- an onsite substation
- a battery energy storage system (BESS)
- permanent wind monitoring equipment (LiDAR)
- site access improvements, through the upgrading of the existing junction off the B4501
- onsite access tracks (new roads and upgraded existing roads/tracks), passing places and vehicle turning heads
- underground power cables linking the wind turbines and the substation
- watercourse crossings and associated infrastructure
- onsite signage
- appropriate drainage measures
- micrositing up to 50 m, and
- biodiversity enhancements proposals.

1.3.2 Full details of the Proposed Development are provided in ES Volume II, Chapter 2: Description of the Proposed Development.

1.4 Aims

1.4.1 This report provides a review of available relevant Site information and outline details for the proposed new and upgraded crossing structures that would be required to permit development construction. Consideration of sizing for management of flood flow is included.

1.5 Assessment Method

1.5.1 The assessment has involved the following stages:

- desk study
- site reconnaissance, and
- crossing assessment and design guidance.

2 WATERCOURSE CROSSING ASSESSMENT

2.1 Route Selection

2.1.1 Prior to detailed consideration of watercourse crossings, Natural Resource Wales (NRW) would wish to ensure 'good practice' has been followed, including the avoidance or minimisation of the number of crossings. The number of crossings is determined by the proposed access track that will connect proposed turbines and other essential infrastructure for construction and operational purposes. Route selection takes into consideration several key factors including:

- maximum track gradient suitable for the required traffic and loads for construction purposes;
- track geometry includes bend radii, junction layouts, passing infrastructure and turning heads;
- stability and bearing capacity of the ground and adjacent slopes;
- the volumes of 'cut' and 'fill' required to ensure a suitable horizontal and vertical track alignment;
- land-take, determined by route length and other aspects of track geometry;
- the type and nature of bridging structures; and
- whole-life costs for construction and maintenance.

2.1.2 Compromise is always required between competing constraints and concerns. The desire to site turbines and associated hardstanding areas on areas without peat soil, plus a series of environmental and engineering constraints requiring avoidance of sensitive areas and potentially unstable or waterlogged ground, means that the track geometry is constrained by ecological and hydrological features.

2.1.3 There is no direct link between 'optimum', in terms of a balance between environmental and engineering constraints and 'best practice' in the Water Framework Directive context, which is oriented towards the water environment. However, there should not be obvious redundant crossings or crossings that are readily avoidable.

Access Track Design

2.1.4 The water environment and associated concerns formed an integral part of the track design process for the Proposed Development. The design process was developed in an iterative manner, following any changes that were made to proposed turbine and associated infrastructure layout. Careful design has kept the number of watercourse crossings to a practical minimum.

Access Track

2.1.5 Access to the Proposed Development would be via the B4501, which runs along the western part of the application boundary. Access to the Site is proposed via a series of primarily new tracks, with areas of upgraded, pre-existing track. Proposed locations of watercourse crossings are described in **Table 7.2.1** and shown in **Figure 7.2.1 Proposed Locations of Watercourse Crossings**, at the rear of this report.

2.1.6 The majority of the tracks within the Site would be new, apart from an existing section of upgraded track situated between the Site entrance and the south-west of Llaithgwm, passing the entrance compound. Watercourse Crossing (WC) 01 is located along this first section of track, approximately 300 m south-east of the entrance compound, and crosses an unnamed tributary of the Afon Tryweryn.

2.1.7 The new track would diverge from the upgraded track west of Llaithgwm, to pass to the north of Llaithgwm before continuing into the Site for approximately 1.7 km, along the north-west slope of Pen y Bwlch Gwyn. The track would then divide into two main sections, with one route continuing north-east and the other towards the south-east.

2.1.8 The access track to the south-east would provide access to T01, T02, T03 and T04. A loop of track would connect T02 and T03, situated within the valley between Pen y Bwlch Gwyn and Foel Fach. At the south end of the loop, the track would split to give access to the west to T01 and to the south-east to T04 on the northern slopes of Moel Emoel. The substation and batching plant are located immediately north of the junction with the track spurs to T01 and T04.

2.1.9 The north-eastern section of track would provide access to wind turbines T05, T06, T07, T08, WT09 and T10. The track splits just before T06, to give access to T05 situated to the north-east. WC02 is located along the section of track to T05, across an unnamed tributary to the Nant Cefn-coch.

2.1.10 The access track from WT06 continues to the south towards Foel Fach where T07 is located. The track then continues to the south-east of Foel Fach, past T08 and on to cross an unnamed tributary to the Nant Cefn-coch at WC03. Turbines T09 and T10 are located to the east of this crossing, on Moel Darren.

Removal or Modification of Existing Structures

2.1.11 Where a new crossing is proposed adjacent to an existing crossing, it is considered best practice to remove the redundant structure.

2.1.12 An existing culvert is present at WC01, which will require upgrading during track construction.

Cable Crossing

2.1.13 With cables generally being laid alongside access tracks, cable crossings would normally be incorporated as part of track crossing structures. There are no plans for additional cable crossings of watercourses.

2.2 Crossing Descriptions

2.2.1 The proposed crossings have been assessed using a catchment-based approach, involving a desk study and walkover survey.

Desk Study

2.2.2 The desk study consisted of a review of the information relating to the Proposed Development. It involved an examination of the proposed track layout and the identification of watercourses marked on the Ordnance Survey (OS) 1:50,000 scale maps that would require crossings.

Walkover Survey

2.2.3 A walkover survey was undertaken on 14-15 October 2024, during which specific information for each identified crossing location was collated. Information regarding previous high-water activity, including flooding, was recorded to allow an informed decision-making process regarding crossing structures and sizing.

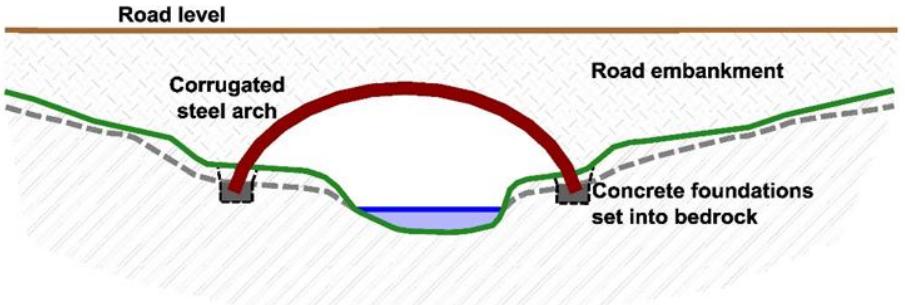
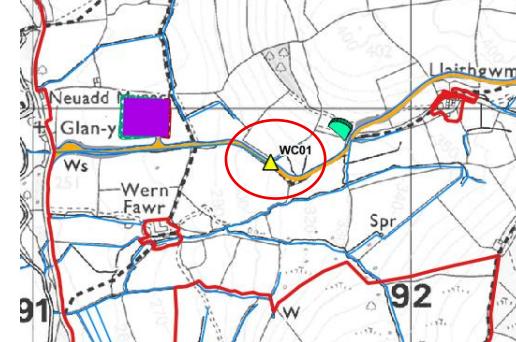
2.2.4 Photographs and detailed field notes were taken to record dimensions of the watercourse channels and flood channels, as well as the type of substrate and any other local information required to inform the proposed crossing type. Locations were recorded using a hand-held GPS unit, with better than 5 m accuracy.

Crossing Details

2.2.5 **Table 7.2.1** details crossings requiring authorisation, photographs of the watercourses in question, and recommendations of the crossing types to be used. The recommendations below are provided to inform the illustrative design proposals submitted as part of the DNS application and specifics of crossing types and structures would be confirmed as part of the detailed design. All crossings are shown in **Table 7.2.1**.

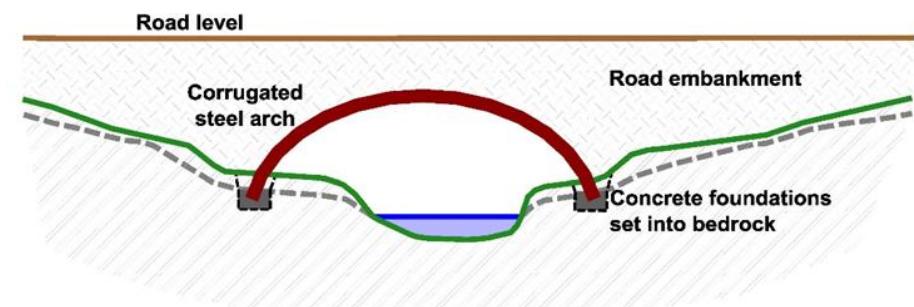
2.2.6 All watercourse crossing structures would be designed to accommodate a 1-in-100-year flood event plus allowance for climate change. Design details would be confirmed post-consent to ensure that good practice standards are being met.

Table 7.2.1 Watercourse Crossing Details

Watercourse Crossing Details	
Crossing:	WC01
Location:	Located along upgraded existing track between site entrance and Llaithgwm.
Watercourse:	Unnamed tributary to Afon Tryweryn (Tryweryn – Dee to Mynach catchment).
NGR:	SH 91626 40858
Description:	Existing track. Plastic pipe culvert c. 0.4 m diameter. Watercourse has been modified to improve field and track drainage. No obvious indications of high-water flows. Channel banks are well-vegetated.
Catchment Area	20.0 km ²
Crossing Type:	Existing pipe culvert. Will require upgrade to bottomless arch or box culvert.
 <p>Indicative cross-section, not to scale</p>	
 <p>View upstream (S)</p>  <p>View downstream (NW)</p>	
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Watercourse Crossing Details

Crossing:	WC02
Location:	Access track between T05 and T06.
Watercourse:	Unnamed tributary of Nant Cefn-coch (Meloch catchment)
NGR:	SH 94056 42061
Description:	Varies between poorly defined and narrow, incised channel, approximately 0.5 m wide. Watercourse bank cut into clay-rich till deposits, well-vegetated and overgrown in places. Channel is heavily eroded from quad bikes crossing, leading to water discolouration downstream.
Catchment Area	16.1 km ²
Crossing Type:	New crossing – bottomless arch or box culvert.



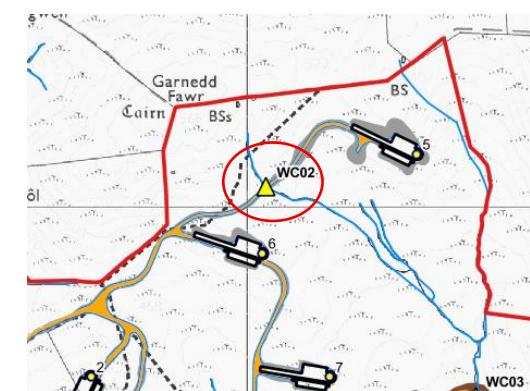
Indicative cross-section, not to scale



View across stream (NE), showing narrow incised channel.



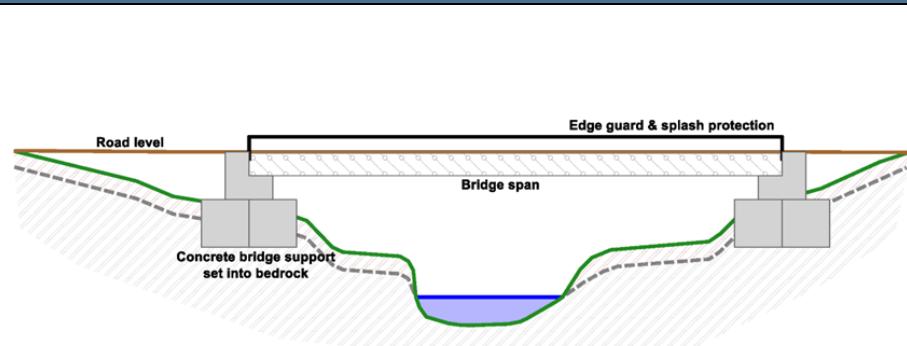
View downstream (SE), showing poorly defined channel with erosion from quad bike crossings.



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Watercourse Crossing Details

Crossing:	WC03
Location:	Access track between WT08 and WT09/WT10.
Watercourse:	Unnamed tributary of Nant Cefn-coch (Meloch catchment)
NGR:	SH 94693 41424
Description:	Watercourse in a defined valley, with channel 1-2 m wide and up to 0.4 m deep. Moderate flow, with stepped small waterfalls and interlocking spurs. Bed includes a mix of pebbles, cobbles and bedrock. Banks quite overgrown with rushes. Distinct high water flow evidence.
Catchment Area	16.10 km ²
Crossing Type:	Bridge. Refer to ES Vol IV Fig 2.10 and Fig 2.11.



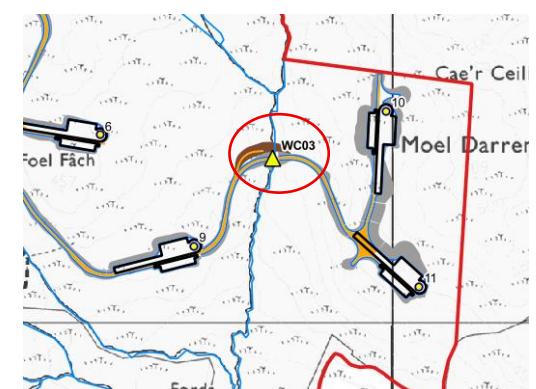
Indicative cross-section, not to scale



View upstream (N)



View downstream (S)



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Additional Watercourse Crossings and Channel Modifications

2.2.7 In addition to the watercourse crossings listed in **Table 7.2.1**, one other crossing of a minor watercourse would be required. The location and details of this crossing are provided in **Table 7.2.2**.

Table 7.2.2 Overview of Minor Watercourse Crossings

Name	NGR	Comments
M01	SH 93570 41733	New crossing within the Site. Small tributary of Nant Gau flowing south-west at track intersection between T02 and T06.



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3 CONCLUSIONS

- 3.1.1 Watercourse crossing locations have been identified and assessed. Appropriate conceptual crossing designs have been suggested for new and upgraded crossings, with proposed designs ensuring that watercourses retain their natural hydromorphology and ecological characteristics where possible.
- 3.1.2 Three new main crossings have been identified, with two new crossing locations and one existing crossing that will require upgrade. One crossing of a minor watercourse has also been identified. Additional drainage structures would be required to accommodate seasonal flow and flow in ditches and drainage channels to ensure continuity of flow and to prevent erosion damage to access tracks.
- 3.1.3 Outline crossing designs have taken account of flood water conveyance. Details will be provided post-consent within the detailed design specifications, including any proposals for the replacement of existing structures, due to their poor condition, bearing capacity or inferior size for conveyance capacity.



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REFERENCES

UK Government, 2017. *The Water Environment (Water Framework Directive) (England and Wales) Regulations*. [Online]
Available at: <https://www.legislation.gov.uk/ksi/2017/407/contents>
[Accessed 2025].



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FIGURES

Figure 7.2.1 Proposed Locations of Watercourse Crossings

