

# **Appendix 3 Further Information Response - Ecology**

Lyrenacarriga Windfarm





## DOCUMENT DETAILS

Client: **Churns Energy**

Project Title: **Lyrenacarriga Windfarm**

Project Number: **170749e**

Document Title: **Appendix 3 Further Information Response - Ecology**

Document File Name: **Appendix 2 Ecology Response**

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Rev	Status	Date	Author(s)	Approved By
01	Draft	28.09.2022	PD/PC	PR/MC
02	Final	28.09.2022	PD/PC	PR/MC

# Table of Contents

1.	<b>INTRODUCTION.....</b>	<b>2</b>
1.1	Further Information Item No. 2 – Wording.....	2
1.2	Response to Point A .....	2
1.3	Response to Point B.....	3
1.4	Response to Point E.....	3
1.4.1	Golden Plover Cumulative Collision Risk.....	4
1.5	Response to Point F .....	5
1.6	Public and Statutory Consultee Submissions .....	9
1.6.1	Bird Monitoring.....	9
1.6.2	Whooper Swan.....	10
1.6.3	Snipe .....	11
1.6.4	Barn Owl.....	11
1.6.5	Black-tailed Godwit Collision Risk.....	11
2.	<b>CONCLUSION .....</b>	<b>12</b>
	<b>BIBLIOGRAPHY .....</b>	<b>12</b>

## TABLE OF TABLES

<i>Table 1 Amended Table 7-14 Extent of habitat lost to the proposed development footprint.....</i>	<i>7</i>
<i>Table 2 Amended Table 7-17 Assessment of effects in relation to Hedgerows and Treelines</i>	<i>7</i>
<i>Table 3 Amended Table 7-20 Assessment of Potential Impacts on Bats</i>	<i>8</i>

## TABLE OF PLATES

<i>Plate 1-1 Hedgerow habitat adjacent to the proposed Turbine 16, south aspect .....</i>	<i>6</i>
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## LIST OF FIGURES

<i>Figure 1 Proposed Monitoring Hedgerow at T16 (Fig 6-1 EIAR Chapter 6).....</i>	<i>7</i>
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# 1. INTRODUCTION

This report responds to a request for Further Information issued by An Bord Pleanála under ABP-309121-21 on the 8th of April 2022. The request for Further Information is being made in relation to the proposal for a wind farm development located in Lyrenacarriga, County Waterford and Lyremountain, County Cork.

This report deals specifically with parts a, b, e and f of Further Information Item No. 2 as set out below:

## 1.1 Further Information Item No. 2 – Wording

### Biodiversity

Submissions received from the Development Applications Unit of the Department, from the Ecology Unit of Cork County Council and the Heritage Officer of Waterford County Council in relation to Biodiversity. In particular, you are requested to address the following:

- a) The potential impact of the proposal on the aquatic environment and associated fauna of the Tourig River, particularly at those sections of the river associated with crossing points.
- b) You are requested to provide further information in relation to the presence of Giant Hogweed within the site (Section 7.5.2.7 EIAR) in relation to the location of same and an assessment of the likely impacts and effects of the spread of this species been provided. Measures which may be required to control/eradicate the species should be specified.
- c) Further detail is required in respect of the detailed design of the settlement pond structures
- d) You are requested to respond to concerns expressed in respect of the geochemistry of the borrow pit near the entrance, especially in relation to pyrite and/or marcasite and risk of acid drainage.
- e) You are requested to review and address the in-combination collision risk for golden plover for all wind turbines in the range (12km) of this species from the Blackwater Estuary SPA.
- f) Concern has been expressed that a hedgerow in proximity to turbine 16 remains within the 50m buffer zone for bats with the potential for increased mortality rates for bats at this location. Please address.

This report responds to points a, b, e and f. Points c and d are addressed separately in the report by Hydro Environmental Services.

## 1.2 Response to Point A

**a) The potential impact of the proposal on the aquatic environment and associated fauna of the Tourig River, particularly at those sections of the river associated with crossing points.**

In preparation of the EIAR, survey efforts were carried out on watercourses within and adjacent to the proposed development site. These watercourses included the Glendine, Gortnafira, and Tourig streams. These streams were classified and surveyed for protected habitats and species. Kick samples were also taken from the Glendine and Gortnafira streams to carry out biological water quality assessments. In preparation of this FI response, additional survey efforts were carried out at all proposed water crossings associated with the proposed development and included stream characterizations, as per *A Guide to Habitats in Ireland* (Fossitt, 2000), surveys for protected habitats and species, identification of suitable habitats for protected species, and kick sampling. These additional surveys were carried out on the 7<sup>th</sup> and 8<sup>th</sup> of June 2022 by Pádraig Desmond (B.S., QCIEEM) of MKO.

Further information is provided in relation to the nature of the watercourses on the site, including the Tourig stream, with baseline surveys undertaken at each of the points where the proposed infrastructure crosses these watercourses. There are both proposed new water crossings and proposed upgrades to existing water crossings associated with the Tourig stream and its tributaries. The additional survey results and locations of these proposed water crossings, as well as all other proposed water crossings associated with the proposed development site, are discussed in the Stream Characterization Report which accompanies this FI response (Appendix 1).

The Stream Characterization report details the results of the additional surveys mentioned above and provides the background information that further supports the conclusions of the EIAR. The report also provides an up to date base line against which any potential effects on the aquatic environment can be monitored. It details the results of the additional field surveys including the faunal surveys, characterization of the watercourses and associated biological water quality assessments. It classifies the habitats at each survey station (or water crossing) as per 'A guide to the habitats of Ireland' (Fossitt, 2000) and assigns them Q-Values. Maps of the proposed water crossings and survey stations are provided in Section 1 of the report. The otter and other faunal surveys carried out at each survey station are detailed in the report which can be summarized as: Though suitable habitat for otter was identified and spraint recorded, no indications of breeding otter, or other protected species, were recorded.

As per the Ecological Impact Assessment within the Biodiversity chapter of the EIAR (section 7.6), there is potential for the proposed water crossing works to result in significant effects on aquatic habitats and their associated fauna as a result of deterioration in water quality via the runoff of pollutants. As per Section 7.6.4.1.1 of the EIAR, following the implementation of mitigation, there will be no significant effect on aquatic habitats or species of the Tourig stream as a result of the Proposed Development at any geographic scale.

### 1.3

## Response to Point B

**b) You are requested to provide further information in relation to the presence of Giant Hogweed within the site (Section 7.5.2.7 EIAR) in relation to the location of same and an assessment of the likely impacts and effects of the spread of this species been provided. Measures which may be required to control/eradicate the species should be specified.**

Multi-disciplinary ecological walkover surveys were undertaken in accordance with NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009) on the 7<sup>th</sup> and 8<sup>th</sup> of July 2022. The multi-disciplinary ecological walkover survey comprehensively covered the entire study area. The aim of this survey was firstly to confirm that giant hogweed (*Heracleum mantegassianum*) was present on the site and secondly to ground truth and if necessary, update any surveys that were undertaken to inform the EIAR.

Reference to giant hogweed in Table 7-1 of Section 7.5.2.7 in the EIAR was made in error and no giant hogweed was recorded on the site during the comprehensive survey that was undertaken, and no significant changes to the habitats within the site were recorded.

Despite the fact that giant hogweed was not recorded on the site, as specified in section 7.5.2.7 of the EIAR, a pre-commencement invasive species survey of the entire site will be undertaken to confirm the conditions predicted and, should any invasive species be recorded at that time (including the known presence of rhododendron), appropriate measures will be put in place to prevent the spread of any invasive species during construction or operation of the proposed wind farm. In addition, all necessary precautions will be taken to prevent the introduction of invasive species to the site from elsewhere.

### 1.4

## Response to Point E

This section (1.4) of the response to the further information request relates solely to ornithology and herein sets out the response to the matters raised in part (e) of the Biodiversity Section of the FI issued

by An Bord Pleanála on the 8<sup>th</sup> of April 2022. The response to this issue has been prepared by Senior Ornithologist, Mr. Padraig Cregg (BSc., MSc.) of the MKO Ornithology team who prepared the Ornithology Sections of the EIAR.

***e) You are requested to review and address the in-combination collision risk for golden plover for all wind turbines in the range (12km) of this species from the Blackwater Estuary SPA.”***

It is noted that the wording of the Development Application Unit (DAU) submission is very similar to the above, therefore to avoid duplication these overlapping topics are both addressed below in this section of this FI Ecology Response. The DAU wording is as follows:

***“In-combination collision risk for golden plover, for all wind-turbines in the range (12km) of this species from the Blackwater Estuary SPA.”***

### 1.4.1 Golden Plover Cumulative Collision Risk

It is noted that an impact assessment of cumulative effects including collision risk<sup>1</sup> is provided in Section 8.13 of the EIAR as submitted. Section 8.13.2 of the EIAR states that no potentially significant cumulative habitat loss, disturbance displacement or collision risk effects on any of the Key Ornithological Receptors (KORs) has been identified with regard to the development proposal. For a list of all KORs please refer to Section 8.6 of the EIAR.

Notwithstanding the above and as it has been requested by An Bord Pleanála, a further review has been undertaken of available information to address the potential for in-combination collision risk to result in significant effects acting on golden plover within a 12km radius of the Blackwater Estuary SPA.

A review of the Planning Register for Cork and Waterford County Council shows that there have been several planning applications lodged within the vicinity of the EIAR study area. Many of the existing/proposed developments within the EIAR study area relate to one-off housing or are agricultural in nature. Owing to the scale, and primarily the nature of these developments, significant cumulative collision risk impacts are not predicted. There are several planning applications for wind farm development and associated infrastructure within 12km of the Blackwater Estuary SPA. Other wind farm developments have the potential to give rise to cumulative collision risk effects. Further details on these applications are available below.

There are three other wind farm developments within a 12km radius of the Blackwater Estuary SPA: two in Co. Waterford (Woodhouse Wind Farm and Knocknamona Wind Farm) and one in Co. Cork (Knocknagappagh Wind Farm).

#### ➤ Woodhouse Wind Farm (existing)

Woodhouse is c. 8km from the Blackwater Estuary SPA. This wind farm consists of eight turbines in two parts, one with five turbines and one with three turbines. The EIS was consulted to determine cumulative impacts from the proposed development site. The EIS reported no golden plover activity at the site<sup>2</sup>. The EIS concluded that, given the low ecological interests at the site, “impacts on the ecology by the proposed development will not be significant”.

No significant residual effects on avian receptors were identified.

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<sup>1</sup> All scenarios within the Turbine Range have been assessed in the assessment of the potential for the proposed development to result in significant collision risk. For further discussion please refer to Section 2.1.1 of the FI Response document.

<sup>2</sup> <https://www.eplanning.ie/WaterfordCCC/AppFileRefDetails/041788/0>

In addition, no operational phase bird monitoring was conditioned with any of the granted permissions for this development.

➤ Knocknamona Wind Farm (amendments proposed)

Knocknamona is c. 6.5km from the Blackwater Estuary SPA. The most recent bird survey information that is available is included in the EIAR for the amendments to Knocknamona Windfarm previously authorised under An Bord Pleanála Ref No. PL93.24400 (Status: Refused 14/01/2021 Appealed 15/06/2021 Ref No. PL 93.309412). The EIAR was consulted to determine cumulative impacts from the proposed development site. The EIAR<sup>3</sup> reported the following concerning golden plover activity:

*There is only two flight observations of this species [golden plover] in the vicinity of the wind farm site. The results of surveys for the area indicate that golden plover do not rely on the wind farm site and surrounding area, are not resident or regularly occurring in the area and that the potential for interactions between the proposed larger turbines and golden plover will be negligible. Based on the negligible potential for interactions between the proposed larger turbines, potential significant impacts to golden plover can be ruled out and therefore this species is not identified as a key sensitive receptor and is not considered further in the assessment.*

No significant residual effects on avian receptors were identified.

In addition, no operational phase bird monitoring was conditioned with any of the granted permissions for this development.

➤ Knocknagappagh Wind Farm (planning permission expired)

Knocknagappagh is c. 5km from the Blackwater Estuary SPA however, the planning permission has since expired and the development was never built. The development consists of a wind farm that includes two no. 1 MW wind turbines. Operational phase bird monitoring was conditioned with the granted permission for this development.

This development cannot, therefore, contribute to any cumulative effects. Having reviewed the best available information, a golden plover (collision risk) cumulative impact assessment was undertaken with reference to the above information

## 1.5

## Response to Point F

**f) Concern has been expressed that a hedgerow in proximity to turbine 16 remains within the 50m buffer zone for bats with the potential for increased mortality rates for bats at this location. Please address.**

Turbine 16 is located in the Western envelope (Figure 6-1 of the Bat Survey Report that accompanies the EIAR and provided again below). There is approximately 80.2m of hedgerow located to the east of this turbine that falls within the 50m felling buffer of the blade width. This hedgerow is not proposed to be felled as it runs along the site boundary. It is the opinion of MKO that it would be premature to remove this section of hedgerow, based on the potential for its retention to result in bat fatalities. An image of this section of hedgerow is provided in Plate 1-1 below and its location in relation to T16 is shown in Figure 6-1 of the EIAR bat survey (provided below).

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<sup>3</sup> <https://www.eplanning.ie/WaterfordCCC/AppFileRefDetails/20845/0>





*Plate 1 | Hedgerow habitat adjacent to the proposed Turbine 16, south aspect*

As specified in the EIAR, the turbine will be monitored post construction. Monitoring will be completed in line with the post construction monitoring proposal for the site, as detailed in section 6.2.1 of the Bat Survey Report that accompanies the EIAR. Monitoring will be conducted in line with SNH guidelines and comprise of static monitoring at turbine bases and at nacelle level. Carcass searches, to monitor and record bat fatalities shall take place at each turbine. If significant bat fatalities are recorded, adaptive mitigation in the form of bespoke curtailment or removal of the hedgerow will be undertaken.

However, in the light of the concerns raised in the Further information request, it is recognised that An Bord Pleanála may determine that it is more appropriate to remove the hedgerow and therefore to minimise any associated potential for effects on bat species as a result of collision with T16.

To facilitate the Environmental Impact Assessment of this alternative scenario, a revised impact assessment is provided below. This shows amended impact assessments relating to loss of treeline and hedgerow (Amended Tables 7-14 and 7-17) and bats (Amended Table 7-20) of the impact assessment of the EIAR to account for the additional loss of hedgerow habitat and mitigations required. These amended tables are provided below.



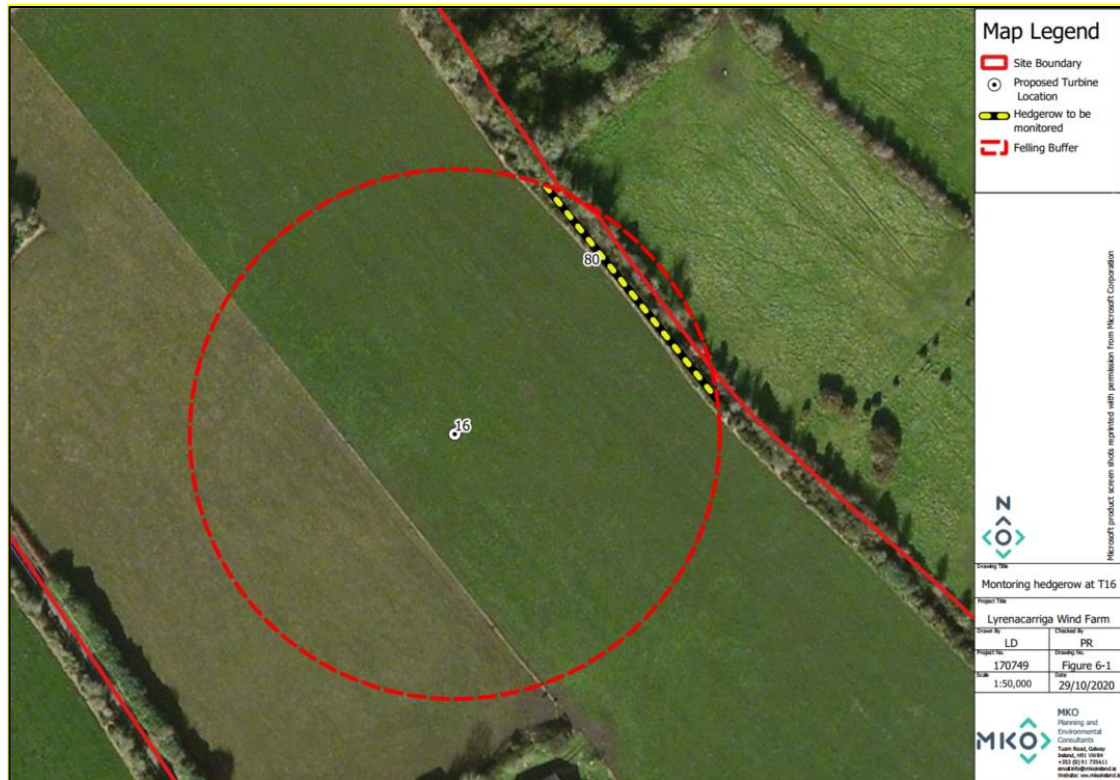


Figure 2 Proposed Monitoring Hedgerow at T16 (Fig 6-1 EIAR Chapter 6)

Table 1 Amended Table 7-14 Extent of habitat lost to the proposed development footprint

Habitat	Area (ha)/length (km) to be lost
<b>KER Habitats</b>	
Wet willow-alder-ash woodland (WN6)	0.02ha
Hedgerow (WL1)/Treelines (WL2)	Approx. 316 linear meters
Depositing/lowland rivers (FW2)	0
<b>Non KER Habitats</b>	
Improved agricultural grassland (GA1)	2.3ha
Wet grassland (GS4)	0
Scrub (WS1)	0.042ha
Conifer plantation (WD4) /Eucalyptus plantation	18.8ha
Spoil and bare ground	NA
Buildings and other artificial surfaces (Roads)	0.037ha
Arable crop (BC1)	1.4ha

Table 2 Amended Table 7-17 Assessment of effects in relation to Hedgerows and Treelines

<b>Description of Effect</b>	The proposed development will result in the loss of approximately 316 metres of hedgerow and tree line as a result of the proposed development. This is predominantly associated with the incorporation of mitigation for bats around each turbine in order to reduce their occurrence in close proximity to the turbines, and ultimately to avoid mortality.
<b>Characterisation of unmitigated effect</b>	The loss of 316 metres of hedgerow constitutes a permanent negative effect on these habitats respectively. This would be reversible following the decommissioning of the proposed development.
<b>Assessment of Significance prior to mitigation</b>	In the absence of mitigation, the loss of these linear landscape features is considered to be a long-term slight significant effect on a receptor of Local Importance (Higher Value) at the local geographic scale only. This not considered to be significant at any other geographic scale.

<b>Mitigation</b>	In order to offset for the loss of hedgerow and treeline habitat to the proposed development (predominantly associated with bat mitigation measures), it is also proposed to plant 236 linear metres of new hedgerow within large areas of agricultural/arable lands to increase connectivity locally. The locations in which the proposed planting will be located will be subject to final landowner agreement. However, indicative areas for planting are proposed in Figure 7-13 of the EIAR. The species composition will be similar to that in the surrounding landscape i.e. hawthorn, blackthorn and semi-mature native tree species. There will therefore be no net loss in hedgerow or treeline habitat. In addition, connectivity to the wider landscape will be maintained around turbines where hedgerows and treelines are retained.
<b>Residual Effect following Mitigation</b>	Following the implementation of the mitigation described above, there will be a short-term loss of hedgerow and treeline. Following completion of construction works, this will be replaced with linear features of planted hedging and semi-mature trees. There will be no significant residual effect on linear landscape features at any geographic scale as a result of this development.

Table 3 Amended Table 7-20 Assessment of Potential Impacts on Bats

<b>Description of Effect</b>	<p>The current proposal has been designed to minimise impacts on the receiving environment and maximises the use of existing infrastructure at the site including internal access tracks. Consequently, the Proposed Development footprint is dominated by modified habitats including conifer plantation.</p> <p>As per SNH Guidance, wind farms present four potential risks to bats:</p> <ul style="list-style-type: none"> <li>• Collision mortality, barotrauma and other injuries; (<b>Operational Phase Impact</b>)</li> <li>• Loss or damage to commuting and foraging habitat;</li> <li>• Loss of, or damage to, roosts;</li> <li>• and Displacement of individuals or populations.</li> </ul> <p>For each of these four risks, the detailed knowledge of bat distribution and activity within the study area has been utilised to predict the potential effects of the proposed development on bats.</p> <p>Bat surveys undertaken in 2019 form the core dataset for the assessment of effects on bats.</p>
<b>Characterisation of unmitigated effect</b>	<p><b>Loss or damage to commuting and foraging habitat</b></p> <p>In the absence of appropriate design, the loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. However, the development is predominantly located within a Commercial forestry, agricultural grasslands and linear landscape features such as hedgerows and treelines have been largely avoided.</p> <p>To comply with SNH recommendations in relation to habitat buffering to avoid bat fatalities, there is a requirement to remove approximately 316m of hedgerow and tree line in proximity to Turbines 7 and 16 (Figures 5-1 and 6-1 in appendix 7.2 of the EIAR bat report). In relation to commuting bats locally, this loss is not considered to be significant as there is an extensive network of linear landscape features in the general area that will be fully retained.</p> <p>Consequently, there will be no significant habitat fragmentation, loss of commuting habitat or loss of foraging habitat associated with the buffering requirement.</p> <p>In addition, the opening up of conifer forestry plantations to facilitate turbine construction will also result in a net gain in linear landscape features available for foraging and commuting bats.</p> <p>No significant effects with regard to loss of commuting and foraging habitat are anticipated.</p> <p><b>Loss of, or damage to, roosts</b></p> <p>The development is predominantly located within commercial forestry and agricultural land. No bat roosts were recorded on site.</p> <p>No roosting sites suitable for maternity colonies, swarming or hibernation will be impacted by the proposed development.</p> <p>No significant effects with regard to loss of, or damage to, roosts are anticipated.</p> <p><b>Displacement of individuals or populations</b></p> <p>The development is predominantly located within a commercial forestry and agricultural land. In the absence of mitigation, the loss of 236 linear metres of hedgerow features is considered to be a long-term slight negative effect. This is considered to be significant at the local geographic scale only.</p>

	There will be no loss of any roosting site of ecological significance. The habitats on the site will remain suitable for bats and no significant displacement of individuals or populations is anticipated.
<b>Assessment of Significance prior to mitigation</b>	No significant effects with regard to loss of commuting and foraging habitat are anticipated. No significant effects with regard to loss of, or damage to, roosts are anticipated. No significant displacement of individuals or populations is anticipated.
<b>Mitigation</b>	The development is predominantly located in plantation forestry (WD4) and some improved agricultural grassland (GA1) and linear landscape features such as hedgerows and treelines have been largely avoided. Although no significant effects are anticipated, it is proposed to offset hedgerow loss by planting additional hedgerow to ensure that there is a net gain in linear landscape features in the local area, see Figure 7-13 of the EIAR. As described in Section 7.6.4.1.3 of the EIAR, the locations in which the proposed planting will be located will be subject to final landowner agreement. In addition, the opening of conifer forestry plantations to facilitate turbine construction will result in a net gain in linear landscape features available for foraging and commuting bats. Full detail of mitigation for bat is provided in the Bat Report (Appendix 7.2 of the EIAR)
<b>Residual Effect following Mitigation</b>	There is no potential for the construction of the Proposed Development to result in significant effects on the local bat population at any geographic scale.

To conclude, in relation to the concern expressed over a section of hedgerow to be retained within the 50 meter buffer of Turbine 16, it is the opinion of MKO that it would be premature to remove this section of hedgerow, based on the potential for its retention to result in bat fatalities. However, if An Bord Pleanála deemed it more appropriate to remove the hedgerow to minimise any associated potential for effects on bat species as a result of collision with T16, the appropriate amendments have been made to Tables 7-14, 7-17, and 7-20 of the EIAR and are given above. These amendments account for the additional loss of approx. 80.2 meters of hedgerow.

## 1.6 Public and Statutory Consultee Submissions

The applicant has reviewed all submissions that have been lodged by third parties and the various statutory consultees. Following this review, it is considered that the initial application documentation combined with this response to the further information request issued by the Planning Authority comprehensively deals with any issues raised. In the interests of completion and clarity, however, the applicant is taking this opportunity to provide further discussion and detail in relation to the items that have been raised in the submissions. As was suggested by An Bord Pleanála the submissions have been addressed by topic.

### 1.6.1 Bird Monitoring

Cork County Council were largely satisfied that the proposed development would not give rise to significant impacts on the local avian community, however, recommend an adaptive approach to the monitoring proposed in the EIAR. The wording was as follows:

*The Heritage Unit of Cork County Council is largely happy that the proposal does not represent a significant threat to protected or qualifying avian species of nearby Special Protection Areas...However, it is considered necessary that the pre and post construction monitoring proposed within the EIAR be conducted and should circumstances change as to the usage of the site either as breeding habitat, foraging habitat or a migration route for avian species listed as qualifying interests of the nearby SPAs or listed under Annex I of the birds Directive, which*

*could result in significant effects on their populations, then a fluid approach be taken as to avoid any such impacts e.g. ceasing of specific turbine operation during certain seasons.*

It is noted that a comprehensive suite of commencement/pre-construction and operational phase monitoring is already proposed in Section 8.11 of the EIAR as submitted. In summary, the following is proposed:

- Pre-commencement surveys will be undertaken prior to the initiation of works at the wind farm. The verification survey will include a thorough walkover survey to a 500m radius of the development footprint and/or all works areas, where access allows. If winter roost sites or breeding activity of birds of high conservation concern is identified, the roost or nest site will be located and earmarked for monitoring at the beginning of the first winter season or breeding season (respectively) of the construction phase. If it is found to be active during the construction phase no works shall be undertaken within a 500m buffer (Forestry Commission Scotland, 2006; Ruddock & Whitfield, 2007) in line with best practice. No works shall be permitted within the buffer until it can be demonstrated that the roost or nest is no longer occupied.
- In line with best practice measures, a detailed post-construction Bird Monitoring Programme has been prepared for the operational phase of the Proposed Development, please refer to EIAR Appendix 8-7 for further details. The programme of works will monitor parameters associated with a collision, displacement/barrier effects and habituation during the lifetime of the project. Surveys are proposed to be scheduled to coincide with Years 1, 2, 3, 5, 10 & 15 of the lifetime of the wind farm. Monitoring measures are based on guidelines issued by the Scottish Natural Heritage (SNH, 2009).

The proposed programme of monitoring was not proposed in response to any identified significant effect but rather as a best practice measure (SNH, 2009). The monitoring is comprehensive and considered entirely adequate in this regard. The results of this monitoring will be reported to the Planning Authority following each monitoring year and will include recommendations that may inform additional mitigation or adaptation if required.

Adaptive management is an iterative process whereby the results of previous monitoring are analysed to inform future monitoring or mitigation as relevant. As the Bird Monitoring Programme is considered entirely adequate as currently submitted, no change will be proposed unless there is a significant change in the use of the site by the local avian community. Similarly, no requirement for additional mitigation is anticipated. However, if following monitoring, bird usage on the site changes and the potential for negative effects is identified, adaptive mitigation will be employed to avoid any potential for significant effects on avian receptors.

## 1.6.2 Whooper Swan

Concerns are raised related to the potential for the proposed development to significantly impact whooper swans. For example, one such submission stated:

*The wind farm project site is located between the flight paths of Blackwater Callows SPA and Blackwater Estuary SPA, and wind turbines form a collision risk for multiple SCIs of these European sites.*

*There is a potential risk that the flight of the whooper swans would bring the whooper swans within the vicinity of the wind farm turbines and imminent threat of loss and collision with turbine blades.*

A regularly used whooper swan commuting corridor as described was not identified during surveys. As is noted in Section 8.4.2 of the EIAR, whooper swans were only recorded once during vantage point surveys. Furthermore, there were no observations of whooper swan during dusk hen harrier winter roost surveys, this is of note given whooper swans are known to commute to roost sites at dusk. There were no other observations within 4.5km of the wind farm site throughout a comprehensive suite of surveys (please

see Section 8.2.4 of the EIAR for survey details). There were 23 observations of whooper swan recorded during dedicated waterfowl surveys, all of which were more than 4.5km from the proposed development site (please see EIAR Appendix 8-3, Table 5). Flock sizes range from five to 209 birds.

Notwithstanding the above, it is acknowledged that the proposed development is located approximately between the Blackwater Callows SPA and Blackwater Estuary SPA and if whooper swans were to travel between these two sites there would be the potential to collide with the proposed turbines in absence of avoidance behaviour. However, following two full years of survey in strict accordance with SNH 2017, this species was only recorded on one occasion.

It is noted in the literature (SNH, 2018<sup>4</sup>) whooper swans show a very high rate of turbine avoidance (99.5% avoidance). That is to say, a whooper swan flying towards a wind farm will avoid a collision 99.5% of the time (SNH, 2018). In the present theoretical scenario, the birds will detect and manoeuvre around the turbines 99.5% of the time on route to/from the Blackwater Callows SPA and Blackwater Estuary SPA.

In the absence of evidence of a regularly used whooper swan commuting corridor that crosses the site and the high rate of turbine avoidance demonstrated by this species and the infrequent occurrence of the species, significant collision risk is unlikely.

In addition, it is noted that an impact assessment of cumulative effects including collision risk is provided in Section 8.13 of the EIAR as submitted. Section 8.13.2 of the EIAR states that no potentially significant cumulative habitat loss, disturbance displacement or collision risk effects on any of the KORs has been identified with regard to the development proposal. In the specific case of whooper swan, there was only a single (90-second flight) observation of this species at the proposed development throughout two years of surveying. As a result of such a low rate of occurrence, no pathway to significant effects was identified. Please see Section 8.6 of the EIAR for further discussion. It is reasonable to conclude that such minimal impacts could not give rise to significant cumulative effects.

Furthermore, while no significant effect has been identified, in line with best practice and following a precautionary approach, a comprehensive programme of operational phase surveys is proposed in the EIAR to monitor for interactions between the proposed development and the local avian community. Please refer to EIAR Appendix 8-7 for further details. The programme of works will monitor parameters associated with collision risk, displacement/barrier effects and habituation during the lifetime of the project. The results of this monitoring will be reported to the Planning Authority following each monitoring year and will include recommendations that may inform additional mitigation if required.

### 1.6.3 Snipe

Concerns are raised in relation to impacts on snipe.

It is noted in Section 8.8.3.9 of the EIAR that an impact assessment is undertaken for snipe for which no significant effects were identified. It is noted that the majority of the proposed development site is located in commercial forestry. A habitat not favoured by this species.

### 1.6.4 Barn Owl

Several submissions discuss the potential occurrence of barn owl locally. However, following two full years of survey in strict accordance with SNH 2017, this species was not recorded.

### 1.6.5 Black-tailed Godwit Collision Risk

Concerns were raised in relation to black-tailed godwit collision risk.

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<sup>4</sup> Scottish Natural Heritage (2018) Avoidance rates for the onshore SNH wind farm collision risk model.



As detailed in Section 8.4.14 of the EIAR, numerous species were recorded at wetlands, at distances up to ten kilometres from the wind farm, but never on or near the proposed development site. This is likely due to a lack of suitable waterfowl habitat onsite. These species included bar-tailed godwit, black-tailed godwit, brent goose, curlew, dunlin, little egret, redshank, ringed plover, shelduck, shoveler and wigeon. The dominant habitat type within the proposed development site is conifer plantation. This habitat does not provide suitable foraging or roosting habitat for any of the species listed above and would therefore not be expected to attract them to the proposed development area. Consequently, it is unsurprising that none of these species were observed flying over the proposed development site during the extensive two-year survey effort.

Significant collision risk is therefore not predicted for black-tailed godwit nor any of the other wetland species that were not recorded on or near the proposed development.

2.

## CONCLUSION

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## **APPENDIX 1**

### **STREAM CHARACTERISATION AND OTTER SURVEY**



## **Stream Characterization and Otter Survey**

Lyrenacarriga Wind Farm  
Further Information  
Request





## DOCUMENT DETAILS

Client: **Innogy**

Project Title: **Lyrenacarriga Wind Farm Further Information Request**

Project Number: **170749-e**

Document Title: **Stream Characterization and Otter Survey**

Document File Name: **Stream characterization – D1 – 2022.07.12 – 170749-e**

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Rev	Status	Date	Author(s)	Approved By
01	Draft	12.07.2022	PD	PR
02	Final	2022.09.28	PD	PR

# Table of Contents

1.	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	Survey Background and Methodology .....	1
2.	<b>DESCRIPTION OF RELEVANT WATER CROSSING WORKS.....</b>	<b>3</b>
2.1	Watercourse Crossings .....	3
3.	<b>DESK STUDY .....</b>	<b>5</b>
3.1	Inland Fisheries Ireland (IFI) Records.....	5
3.2	Environmental Protection Agency (EPA) Records.....	5
4.	<b>PREVIOUS SURVEYS .....</b>	<b>7</b>
5.	<b>WATER CROSSING STREAM CHARACTERIZATION AND OTTER SURVEY .....</b>	<b>8</b>
5.1	Methodologies.....	8
5.1.1	Habitat classification.....	8
5.1.2	Otter survey .....	8
5.1.3	Kick sampling .....	8
5.2	Water Crossings.....	9
5.2.1	Water crossing 1.....	9
5.2.2	Water crossing 2 .....	10
5.2.3	Water crossing 3 .....	11
5.2.4	Water crossing 4.....	12
5.2.5	Water crossing 5.....	13
5.2.6	Water crossing 6.....	14
5.2.7	Water crossing 7 .....	15
5.2.8	Water crossing 8.....	17
5.2.9	Water crossing 9.....	17
5.2.10	Water crossing 10.....	19
5.2.11	Water crossing 11.....	20
5.2.12	Water crossing 12.....	21
5.2.13	Water crossing 13.....	22
6.	<b>DISCUSSION .....</b>	<b>24</b>
7.	<b>CONCLUSION .....</b>	<b>25</b>
8.	<b>REFERENCES .....</b>	<b>27</b>
	<b>TABLE OF TABLES</b>	
	<i>Table 2-1 Water quality monitoring stations and associated Q values.....</i>	<i>6</i>
	<i>Table 2-2. Watercourses on site with relevant water quality and Risk statues .....</i>	<i>6</i>
	<i>Table 3-1 Water crossing 1 Invertebrate Results.....</i>	<i>9</i>
	<i>Table 3-2 Water crossing 5 Invertebrate Results.....</i>	<i>13</i>
	<i>Table 4-1 Water crossing location with Q-scores.....</i>	<i>24</i>

# 1. INTRODUCTION

## 1.1 Survey Background and Methodology

MKO were appointed by Curns Energy Ltd. to conduct stream characterization and other surveys of water crossings associated with the proposed Lyrenacarriga Wind Farm. Survey efforts relate to a Further Information request from An Bord Pleanála which sought clarity on;

*“The potential impact of the proposal on the aquatic environment and associated fauna of the Tourig River, particularly at those sections of the river associated with crossing points”.*

The survey work was conducted by Pádraig Desmond (B.Sc. Eco (Hons)) of MKO on the 7<sup>th</sup> and 8<sup>th</sup> of July 2022. Pádraig has worked in ecology for more than two years, having worked on various ecological projects. Pádraig has worked in consultancy for over a year and has carried out numerous stream characterization and water quality surveys. This report has been reviewed by Pat Roberts (B.Sc., MCIEEM) who has over 15 years’ experience in ecological assessment.

Surveys were carried out at nine existing water crossings proposed for upgrade and four proposed new water crossings associated with the wind farm access roads, the collector cable route, and the turbine delivery route. Previous surveys were carried out downstream of the proposed development site by MKO in 2019. These included three locations on the Glendine stream and one location on the Gortnafira stream.

The locations of the previous surveys carried out in 2019 and the thirteen water crossings associated with the proposed development are shown in Figures 4-6 and 7-3 of the EIAR and are again provided below.

Stream characterization surveys included kick sampling, habitat classification (Fossitt, 2000), stream morphology and assessments of submerged, emergent, and riparian macrophytes.

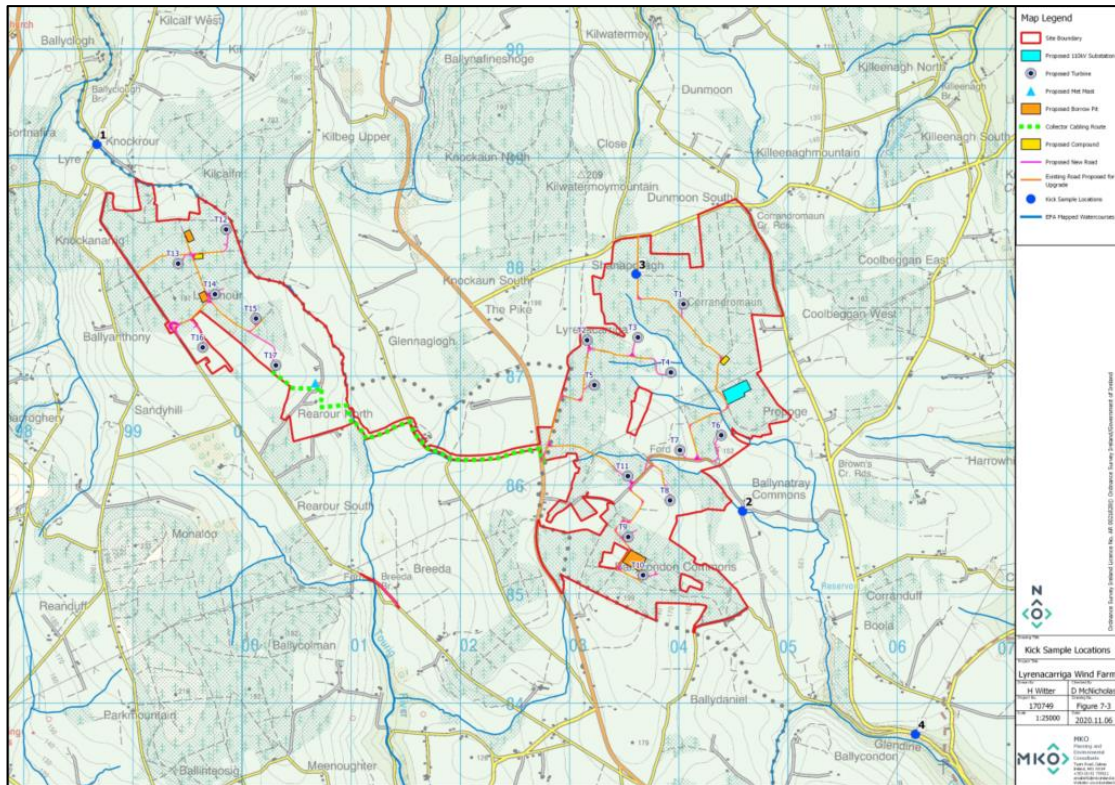


Figure 1 7-3 Kick Sample Locations

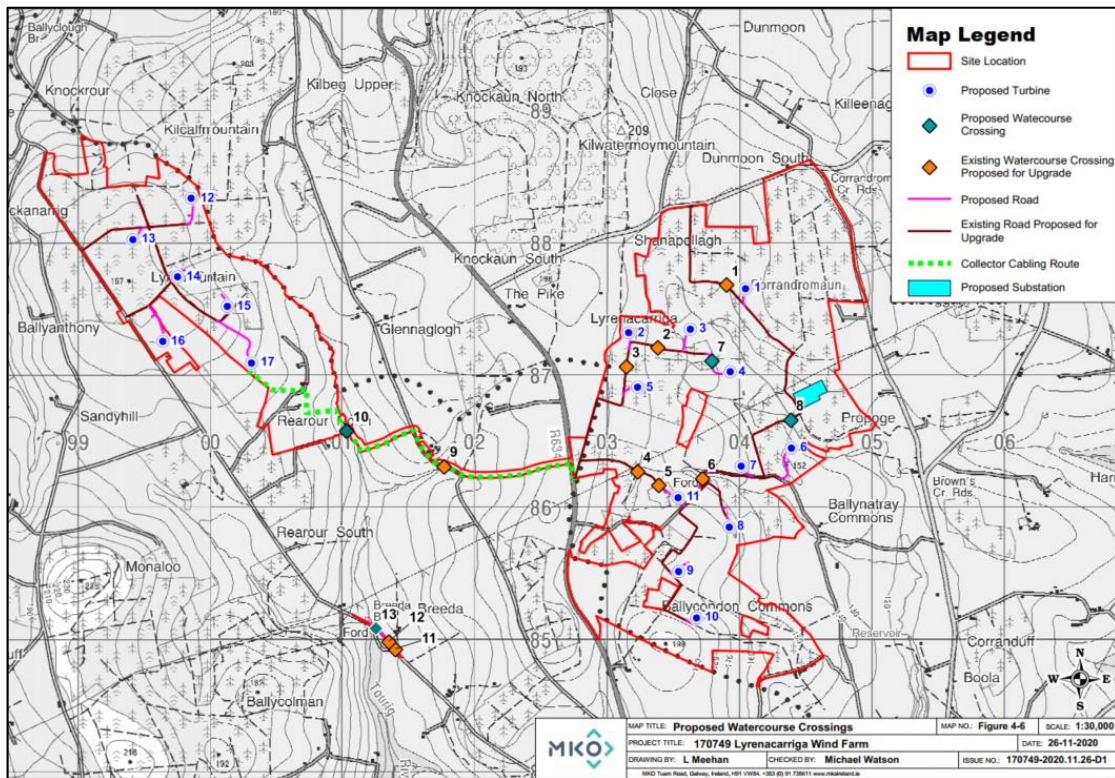


Figure 2 Figure 4-6 Proposed Watercourse Crossings  
comment



## 2. DESCRIPTION OF RELEVANT WATER CROSSING WORKS

### 2.1 Watercourse Crossings

Proposed new stream crossings will be bottomless box culverts or clear span bridges and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the watercourses at the proposed water crossing locations. Where the proposed underground onsite cabling route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road, with no instream works proposed.

The design of the proposed crossings follows Inland Fisheries Ireland's *'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters'* (2016). During near stream construction work, double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed within 50 metres of the crossing construction areas.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines *'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945'*, and in consultation with Inland Fisheries Ireland. New watercourse crossings will require a Section 50 application (Arterial Drainage Act, 1945), which will be obtained prior to works. The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

#### 2.1.1 Clear Span Bridges

The construction methodology for the installation of a pre-cast concrete clear-span bridge is presented below:

- The access road on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- The abutment will consist of concrete panels which will be installed on a concrete lean mix foundation to provide a suitable base. The base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of pre-cast concrete slab across the watercourse to provide temporary access for the excavator.
- All pre-cast concrete panels and slabs/beams will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse.
- A concrete deck will be poured over the beams/slabs which span across the river. This will be shuttered, sealed and water tested before concrete pouring can commence.

## 2.1.2 Culverting

The construction methodology for the installation of a pre-cast concrete bottomless box culvert is presented below:

- The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of pre-cast concrete slab across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse.
- Once the foundation base has been completed, the pre-cast concrete box culvert will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse.
- Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse.
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.



### 3. DESK STUDY

#### 3.1 Inland Fisheries Ireland (IFI) Records

Inland Fisheries Ireland has been assigned the responsibility by the EPA of delivering the fish monitoring requirements of the Water Framework Directive (WFD) in Ireland. A search of the Inland Fisheries Ireland database ([wfdfish.ie](http://wfdfish.ie)) was carried out to inform the species that occur within the watercourses connected to the works area. While no data was available on the small watercourses that occur on the site or immediately downstream, information was available on the River Blackwater, which is located approx. 7.1km downstream of the site. A summary of findings based on annual reports conducted by IFI is provided in the paragraphs below.

##### **The Blackwater River**

Fish stock surveys were undertaken at 43 river sites throughout Ireland during the summer of 2010 as part of the programme of sampling fish for the Water Framework Directive (WFD). These surveys are required by both national and European law, with Annex V of the WFD stipulating that rivers are included within the monitoring programme and that the composition, abundance and age structure of fish fauna are examined (Council of the European Communities, 2000).

A total of ten fish species were recorded in the River Blackwater (Lismore) site. Salmon was the most abundant species, followed by flounder, eel, dace, stone loach, minnow, gudgeon, roach, lamprey and three-spined stickleback.

All watercourses associated with the proposed development are tributaries of the River Blackwater. These include the Tourig, the Glendine, and the Gortinafira. No inland fisheries Ireland records were available for these watercourses.

#### 3.2 Environmental Protection Agency (EPA) Records

The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample.

Table 3-1 illustrates the respective Q-value status results from monitoring stations located along rivers which flow through the site or along rivers which are fed directly by watercourses which flow through or around the site.

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The online EPA Envision map viewer provides access to water quality information and individual waterbody status for all the River Basin Districts in Ireland. The EPA Envision map viewer was consulted on 16<sup>th</sup> of August 2022 regarding the water quality status of the rivers which are located downstream of the study area. The WFD River Waterbody Status 2013 – 2018 for the watercourses which flow through the site have been set out in Table 3-2.

Table 3-1 Water quality monitoring stations and associated Q values

Watercourse Name	Sampling station	Location	Q-Value & Water Quality Status	Sampling Year
Tourig	TOURIG - Br SE of Ballycolman	E 201440 N 83450	4 (Good)	1997
	TOURIG - Br nr Park Ho	E 203902.84 N 79919.91	4 (Good)	2003
	Br SW of Tourig Hall	E 206418.87 N 80218.57	4 (Good)	2021
Glenaboy	Ballyclogh Br	E 198559.39 N 89700.72	3-4 (Moderate)	2021
	GLENABOY - Br N of Glenaboy	E 198807 N 89922.5	4 (Good)	1990
	GLENABOY - South Br Tallow	E 199412.45 N 93274.57	4 (Good)	1994
Blackwater	Tallowbridge	E 199887.88 N 94325.65	4 (Good)	2021
Glendine	GLENDINE (BLACKWATER) - Br SSW of Browns Crossroads	E 205232 N 85673.88	4-5 (High)	1990
	Glendine Ch E of Ballycondon	E 206415.58 N 83462.35	4 (Good)	2021
	GLENDINE (BLACKWATER) - 0.1km d/s Glendine Church	E 207120 N 82697.9	4-5 (High)	1990
	GLENDINE (BLACKWATER) - Glendine Br	E 207697.71 N 82345.23	4 (Good)	1990

Table 3-2. Watercourses on site with relevant water quality and Risk statuses

Name	Location	Status	Risk
Tourig	Headwaters originate on the eastern boundary of the western section of the proposed development. It flows southerly, crossing the connector cable route and turbine delivery route.	Good	Not at Risk
Gortnafira	Headwaters originate adjacent to the northern boundary of the western section of the proposed development site. It flows north westerly, away from the site, discharging into the Glenaboy.	Good	Not at Risk
Glendine	Headwaters originate within the eastern section of the proposed development site. Several tributaries flow easterly/south easterly through the site before the main Glendine stream flows south away from the site.	Good	Not at Risk

Status– WFD River Waterbody Status 2010-2015 Risk – WFD River Waterbodies Risk

4.

## PREVIOUS SURVEYS

Kick sampling was carried out at watercourses both within and downstream of the proposed development site in order to inform baseline conditions. These were carried out on the 26<sup>th</sup> of September 2019. Representative locations along watercourses that drain the site were chosen for the assessment. The locations of each watercourse surveyed are provided in Figure 7-3 of the EIAR, which is provided again in section 1.

Biological water quality was assessed through kick-sampling each of these watercourses. Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005)<sup>1</sup>. The applied Q ratings followed the EPA water quality classes and Water Framework Directive status categories. All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a two-minute sample, as per ISO standards for water quality sampling (ISO 10870:2012). Large cobble was also washed at each site where present.

Three of the four sample locations assessed were Q3 ‘Poor’, and one as Q3-4 ‘Moderate’.

Overall, the watercourses with the highest value for fish species were the lower survey reaches of the main watercourses that drain the proposed development site. The small watercourses located in the upper reaches of the catchment that occur within the site were generally upland, eroding watercourses and often featured dry, or partly dry features, generally not conducive to supporting resident salmonids, European eel, lamprey or white-clawed crayfish. These watercourses are generally small and subject to varying water levels associated with periodic rainfall events.

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<sup>1</sup> Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., & MacGarthaigh, M. (2005). *Water quality in Ireland*. Environmental Protection Agency, Co. Wexford, Ireland.

## 5. WATER CROSSING STREAM CHARACTERIZATION AND OTTER SURVEY

The following sections outline the findings of the stream characterization for each of the 13 water crossing locations, including kick sample surveys and otter surveys, carried out by MKO on the 7<sup>th</sup> and 8<sup>th</sup> of July 2022.

### 5.1 Methodologies

#### 5.1.1 Habitat classification

Habitats were classified in accordance with the Heritage Council's 'Guide to Habitats in Ireland' (Fossitt, 2000). Habitat mapping was undertaken in accordance with guidance set out in 'Best Practice Guidance for Habitat Survey and Mapping' (Smith et al., 2011).

Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2010), while mosses and liverworts nomenclature follows 'Mosses and Liverworts of Britain and Ireland - a field guide' (British Bryological Society, 2010).

#### 5.1.2 Otter survey

Dedicated otter surveys were conducted on the 7<sup>th</sup> and 8<sup>th</sup> of July 2022 of the watercourses within the study area. The otter survey was conducted as per TII (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes). This involved a search for all otter signs e.g. spraints, scat, prints, slides, trails, couches and holts. In addition to the width of the rivers/watercourses, a 10m riparian buffer (both banks) was considered to comprise part of the otter habitat (NPWS 2009). The dedicated otter survey also followed the guidance as set out in NRA (2008) 'Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes' and following CIEEM best practice competencies for species surveys (CIEEM, 2013<sup>2</sup>).

#### 5.1.3 Kick sampling

At each water crossing where sufficient flow was present, three-minute kick samples were collected from the stream bed area of approximately one square metre with a standard handnet (250 mm x 250 mm, with a 300 mm bag depth and a 1 mm mesh size). One minute hand searches, of large objects such as tree branches or stones, was undertaken prior to each of the kick samples. The kick sampling time was then divided proportionally among the habitats present in the area, such as fast-moving riffles, shallow water, and silted banks. Samples were sorted on site. Specimens were identified using the FBA Guide to Freshwater Invertebrates (Dobson *et al.*, 2012).

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<sup>2</sup> CIEEM, 2013, *Technical Guidance Series – Competencies for Species Survey*, Online, Available at: <https://cieem.net/resource/competencies-for-species-survey-css/> Accessed: 20.03.2021

## 5.2 Water Crossings

### 5.2.1 Water crossing 1 – Existing watercourse crossing proposed for upgrade

Located in the north-eastern section of the proposed development site, this is an existing 600 mm plastic culverted water crossing. This culvert was not embedded in the riverbed and had a lip on the downstream side, breaking stream continuity. The watercourse was approx. 1.5 meters wide with an average depth of 80 mm. Benthic substrate was composed of gravels with no siltation. This watercourse is classified an Upland/eroding river (FW1). Though the watercourse provides suitable commuting habitat for otter, no indications of otter using this watercourse were recorded.

No submerged or emergent vegetation recorded within the stream. Bankside vegetation included bramble (*Rubus fruticosus* agg.), ivy (*Hedera helix*), wild angelica (*Angelica sylvestris*) and fern species. Shading was high, dominated by willow (*Salix* sp.). Surrounding land use was predominantly forestry.

This watercourse was assigned a Q score of Q3. It was assigned this score as only group C invertebrates were recorded during the kick sample. This watercourse is unnamed and thus, unassigned a status for reference. The score is, however, lower than the status of the receiving Glendine stream which was Q4. The kick sample location is ITM 0603845 0587738 and was taken from a riffle section of the stream.

Table 5-1 Water crossing 1 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	None	None
Group B - Moderately Pollution Sensitive	None	None
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	Present
	<i>Baetis rhodani</i>	Present
	<i>Chironomids</i>	Present
Group D - Very Pollution Tolerant	None	None
Group E - Most Pollution Tolerant	None	None





Figure 5-1 Water crossing 1.

## 5.2.2

### Water crossing 2 – Existing watercourse crossing proposed for upgrade

Located near the western boundary of the eastern section of the proposed development site, this is an existing 400 mm plastic culverted water crossing for a forestry road. The culvert was embedded in the riverbed but waterflow through it was very low. The watercourse was 300 mm wide with an average depth of 15 mm. Benthic substrate was composed of gravels with slight siltation. This watercourse is classified as a Drainage ditch (FW4). Though the watercourse provides suitable commuting habitat for otter, no indication of otter using this watercourse were recorded.

No submerged or emergent vegetation was recorded within the stream. Bankside vegetation included bramble (*Rubus fruticosus* agg.), rush (*Juncus effusus*), Yorkshire fog (*Holcus lanatus*), and wild angelica (*Angelica sylvestris*). Surrounding land use was predominantly forestry, which caused high shading.

No Q score was assigned at this water crossing as no suitable riffle or glide sections for kick sampling were in the vicinity. The location of the water crossing is ITM 0603329 0587270.





Figure 5-2 Water crossing 2

### 5.2.3 Water crossing 3 – Existing watercourse crossing proposed for upgrade

Located near the western boundary of the eastern section of the proposed development site, this is an existing 300 mm concrete culverted water crossing for a forestry road. This watercourse was dry at the time of survey. This feature was not classified as a watercourse as per Fossitt (2000) as it was dry at the time of the survey and did not support wetland vegetation. Therefore, this watercourse does not provide suitable habitat for otter.

No Q score was assigned at this water crossing as the channel was dry. The location of the water crossing is ITM 0603092 0587126.





Figure 5-3 Water crossing 3

#### 5.2.4 **Water crossing 4 – Existing watercourse crossing proposed for upgrade**

Located west of centre of the eastern section of the proposed development site, this is an existing 400 mm concrete culverted water crossing for a forestry road. Stream width was 200mm wide with an average depth of 20mm. Heavy siltation and pooling was recorded upstream of the culvert. This watercourse is classified as a Drainage ditch (FW4). This watercourse does not provide suitable habitat for otter as it provides little fisheries potential for foraging and no suitable areas for resting or breeding were identified.

No instream or emergent vegetation was recorded within this watercourse. Bank vegetation was dominated by forestry, which created high shading.

No Q score was assigned at this water crossing as no suitable riffle or glide sections for kick sampling were in the vicinity. The location of the water crossing is ITM 0603329 0587270.





Figure 5-4 Water crossing 4

## 5.2.5 Water crossing 5 – Existing watercourse crossing proposed for upgrade

Located in the centre of the eastern section of the proposed development site, this is an existing 400 mm plastic culverted water crossing of the Ballynatray Commons stream, which discharges to the Glendine stream to the east, for a forestry road. The invert of the culvert was embedded in the substrate and there was continuous flow at both ends. The watercourse where the kick sample was taken, downstream of the culvert, was 500 mm wide with an average depth of 30 mm. This watercourse is classified as an upland/eroding stream (FW1). Though the watercourse provides suitable commuting habitat for otter, no indication of otter using this watercourse were recorded.

No submerged or emergent vegetation was recorded within the stream. Bankside vegetation included ivy (*Hedera helix*), wild angelica (*Angelica sylvatica*), bramble (*Rubus fruticosus* agg.), ferns and bryophytes. Surrounding land use was predominantly forestry, which caused high shading.

This watercourse was assigned a Q score of Q3. It was assigned this score as the sample was dominated by group C invertebrates with few occurrences of group D. This compares to the WFD status of Q4 given in the EPA map viewer. Kick sample location was ITM 0603368 0586227.

Table 5-2 Water crossing 5 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	None	None
Group B - Moderately Pollution Sensitive	None	None



Indicator Group	Taxon	Dominance
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Dominant</i>
Group D - Very Pollution Tolerant	<i>Chironimidae</i>	<i>Present</i>
Group E - Most Pollution Tolerant	<i>Tubificidae</i>	<i>Present</i>



Figure 5-5 Water crossing 5

## 5.2.6 Water crossing 6 – Existing watercourse crossing proposed for upgrade

Located in the centre of the eastern section of the proposed development site, this is an existing 500 mm plastic culverted water crossing of the Ballynatray Commons stream which discharges to the Glendine stream to the east, for a forestry road. The invert of the culvert was not embedded in the substrate, so flow continuity was broken. The kick sample was taken downstream of the culvert. Here, the stream was 1m wide with an average depth of 40 mm. This watercourse was classified as an upland/eroding stream (FW1). Though the watercourse provides suitable commuting habitat for otter, no indication of otter using this watercourse were recorded.

No submerged or emergent vegetation was recorded within the stream. Bankside vegetation included ivy (*Hedera helix*), wild angelica (*Angelica sylvestris*), cocks' foot (*Dactylis glomerata*), ragwort (*Jacobaea aquatica*), and willow (*Salix* sp.). Surrounding land use was predominantly forestry, which caused high shading.



This watercourse was assigned a Q score of Q3. It was assigned this score as the sample was dominated by group C invertebrates with few occurrences of group D. This compares to the WFD status of Q4 given in the EPA map viewer. Kick sample location was ITM 0603706 0586300.

Table 5-3 Water crossing 6 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	<i>None</i>	<i>None</i>
Group B - Moderately Pollution Sensitive	<i>None</i>	<i>None</i>
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Dominant</i>
	<i>Baetis rhodeni</i>	<i>Common</i>
Group D - Very Pollution Tolerant	<i>Flatworms</i>	<i>Common</i>
Group E - Most Pollution Tolerant	<i>None</i>	<i>None</i>



Figure 5-6 Water crossing 6

## 5.2.7 Water crossing 7 – Proposed Watercourse Crossing

A new water crossing is proposed of the Shanapollagh stream which discharges into the Glendine stream to the east. It is located north of centre of the eastern section of the proposed development site. Stream width was 400 mm wide with an average depth of 30 mm. This watercourse is classified as an upland/eroding stream (FW1). Though the watercourse provides suitable commuting habitat for otter, no indication of otter using this watercourse were recorded.



No submerged or emergent vegetation was recorded within the stream. Bankside vegetation included bracken (*Pteridium aquilinum*), wild angelica (*Angelica sylvestris*), bramble (*Rubus fruticosus* agg.), fox glove (*Digitalis purpurea*), marsh ragwort (*Jacobaea aquatica*), Yorkshire fog (*Holcus lanatus*), and hard rush (*Juncus inflexus*). Surrounding land use was predominantly forestry, which caused high shading, and tillage.

This watercourse was assigned a Q score of Q4. It was assigned this score as the sample was dominated by group C invertebrates with few occurrences of group D and group A. This is in line with the WFD status of Q4 given in the EPA map viewer. The kick sample location was ITM 0603742 0587168 and it was taken from a riffle section of the stream.

Table 5-4 Water crossing 7 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	<i>Heptageniidae</i>	<i>Few</i>
Group B - Moderately Pollution Sensitive	<i>None</i>	<i>None</i>
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Dominant</i>
	<i>Baetis rhodeni</i>	<i>Few</i>
	<i>Uncased Caddis</i>	<i>Few</i>
Group D - Very Pollution Tolerant	<i>Flatworms</i>	<i>Few</i>
Group E - Most Pollution Tolerant	<i>None</i>	<i>None</i>



Figure 5-7 Water crossing 7



## 5.2.8 Water crossing 8 – Proposed Watercourse Crossing

A new water crossing is proposed of the Shanapollagh stream which discharges into the Glendine stream to the east. It is located to the east of the proposed development site. Stream width was 900 mm wide with an average depth of 50 mm. This watercourse is classified as an upland/eroding stream (FW1). Though the watercourse provides suitable commuting habitat for otter, no indication of otter using this watercourse were recorded.

No submerged vegetation was recorded within the stream, but hemlock water dropwort (*Oenanthe crocata*) was recorded as emergent. Bank vegetation included fox glove (*Digitalis purpurea*), hemlock water dropwort (*Oenanthe crocata*), soft rush (*Juncus effusus*), and wild angelica (*Angelica sylvestris*). Surrounding land use was conifer forestry but willow (*Salix* sp.) dominated the stream bank, causing high shading.

No Q score was assigned at this water crossing as there was no suitable riffles or glides to kick sample from. The location of the water crossing is ITM 0604324 0586728.



Figure 5-8 Water crossing 8

## 5.2.9 Water crossing 9 - Existing watercourse crossing proposed for upgrade

Located on the proposed collector cable route for the proposed development, this is an existing culverted water crossing of the Glennagloagh stream for the L7809 road. This discharges into the Tourig stream approx. 625m downstream. It is composed of a stone bridge. Stream width was 1m wide with an average depth of 50 mm. This watercourse is classified as an upland/eroding stream (FW1). Otter spraint was recorded on a rock along the stream bank. The stream provides suitable commuting/foraging habitat for otter but it does not provide suitable breeding/resting habitat.

Submerged and emergent bryophytes were recorded within the stream while bank side vegetation was composed of hogweed (*Heracleum sphondylium*), hearts tongue (*Asplenium scolopendrium*), spleenworts (*asplenium* spp.), ivy (*Hedera helix*), and opposite leaved golden saxifrage (*Chrysosplenium oppositifolium*).

This watercourse was assigned a Q score of Q4. It was assigned this score as the sample was dominated by group B and C invertebrates with few occurrences of group D and group A. This is in line with the WFD status of Q4 given in the EPA map viewer. The kick sample location was ITM 0601713 0586363 and it was taken from a riffle section of the stream.

Table 5-5 Water crossing 9 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	<i>Heptageniidae</i>	<i>present</i>
Group B - Moderately Pollution Sensitive	<i>Leuctra</i>	<i>Few</i>
	<i>Goeridae</i>	<i>Numerous</i>
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Numerous</i>
	<i>Baetis rhodeni</i>	<i>Common</i>
	<i>Uncased Caddis</i>	<i>Few</i>
Group D - Very Pollution Tolerant	<i>Ancylus</i>	<i>Present</i>
	<i>Chironomids</i>	<i>Few</i>
Group E - Most Pollution Tolerant	<i>None</i>	<i>None</i>





Figure 5-9 water crossing 9

## 5.2.10 Water crossing 10 – Proposed Watercourse Crossing

Located on the proposed collector cable route for the proposed development, this is a proposed water crossing of the Tourig stream. Stream width was 2.5m wide with an average depth of 70 mm. This watercourse is classified as an upland/eroding stream (FW1). Though this watercourse provides suitable foraging and breeding habitat for otter, no indication of otter using this watercourse were recorded.

There was no submerged vegetation in the stream but pondweed (*Lemna* sp.) was recorded as emergent vegetation. Bank vegetation was predominantly hemlock water dropwort (*Oenanthe crocata*), bramble (*Rubus fruticosus* agg.), Yorkshire fog (*Holcus lanatus*), and ferns. Heavy shading was recorded which was dominated by willow (*Salix* sp.), gorse (*Ulex europaeas*), and alder (*Alnus glutinosa*).

This watercourse was assigned a Q score of Q4. It was assigned this score as the sample was dominated by group B and C invertebrates with common occurrences of group D and group A. This is in line with the WFD status of Q4 given in the EPA map viewer. The kick sample location was ITM 0600982 0586662, and it was taken from a glide section of the stream.

Table 5-5 Water crossing 10 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	<i>Heptageniidae</i>	<i>Common</i>
Group B - Moderately Pollution Sensitive	<i>Goeridae</i>	<i>Numerous</i>
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Common</i>
	<i>Baetis rhodeni</i>	<i>Common</i>



Indicator Group	Taxon	Dominance
	<i>Ephemerelellidae</i>	<i>Few</i>
	<i>Coleoptera</i>	<i>Present</i>
Group D - Very Pollution Tolerant	<i>Chironomids</i>	<i>Common</i>
Group E - Most Pollution Tolerant	<i>None</i>	<i>None</i>



Figure 5-10 Water crossing 10

### 5.2.11 Water crossing 11 - Existing watercourse crossing proposed for upgrade

Located on the proposed turbine delivery route, this is an existing water crossing of an unnamed stream under an agricultural field. Existing culvert is 2 no. 300 mm plastic pipes. Stream width was 50 mm wide with an average depth of 30 mm. This watercourse is classified as an upland/eroding stream (FW1). Though this watercourse provides suitable commuting habitat for otter, no indication of otter using this watercourse were recorded.

No submerged or emergent vegetation was recorded within the stream. Bankside vegetation included wild angelica (*Angelica sylvatica*) and ivy (*Hedera helix*), with moderate shading of beech (*Fagus sylvatica*).

This watercourse was assigned a Q score of Q3-4. It was assigned this score as the sample was dominated by group B and C invertebrates with few occurrences of group D and group A. This is an unnamed



watercourse so there is no current WFD status assigned. The kick sample location was ITM 0601392 0584990, and it was taken from a riffle section of the stream.

Table 5-6 Water crossing 11 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	<i>Heptageniidae</i>	<i>Few</i>
Group B - Moderately Pollution Sensitive	<i>Goeridae</i>	<i>Numerous</i>
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Common</i>
	<i>Baetis rhodeni</i>	<i>Few</i>
	<i>Uncased Caddis</i>	<i>Few</i>
Group D - Very Pollution Tolerant	<i>Flatworms</i>	<i>Common</i>
	<i>Chironomids</i>	<i>Few</i>
Group E - Most Pollution Tolerant	<i>None</i>	<i>None</i>



Figure 5-11 water crossing 11

## 5.2.12 Water crossing 12 - Existing watercourse crossing proposed for upgrade

Located on the proposed turbine delivery route this is an existing water crossing of an unnamed stream under the L7806 road. This feature was not classified as a watercourse as per Fossitt (2000) as it was dry

at the time of the survey and did not support wetland vegetation. Therefore, this watercourse does not provide suitable habitat for otter.

No Q score was assigned at this water crossing as the stream was dry, so no kick sample was taken. The location of the water crossing is ITM 0601298 0585047.

### 5.2.13 Water crossing 13 – Proposed Watercourse Crossing

Located on the proposed turbine delivery route, this is a proposed water crossing of the Tourig stream under the L7806 road. Stream width was 3m wide with an average depth of 150 mm. This watercourse is classified as an upland/eroding stream (FW1). Though this watercourse provides suitable foraging and breeding habitat for otter, no indication of otter using this watercourse were recorded.

Bryophytes were recorded as submerged and emergent vegetation while bank vegetation was composed of bryophytes, ivy (*Hedera helix*), and ferns. Shading was high of this stream which was dominated by alder (*Alnus glutinosa*).

This watercourse was assigned a Q score of Q4. It was assigned this score as the sample was composed of numerous Group B invertebrates with common numbers of Group A. The sample also had common to few samples of Group C. This is in line with the WFD status of Q4 given in the EPA map viewer. Kick sample location was ITM 0601176 0585140.

Table 5-7 Water crossing 13 Invertebrate Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	<i>Heptageniidae</i>	<i>Common</i>
Group B - Moderately Pollution Sensitive	<i>Goeridae</i>	<i>Numerous</i>
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	<i>Common</i>
	<i>Baetis rhodeni</i>	<i>Common</i>
	<i>Uncased Caddis</i>	<i>Few</i>
	<i>Ephemeralla</i>	<i>Few</i>
Group D - Very Pollution Tolerant	<i>Chironomids</i>	<i>Common</i>
Group E - Most Pollution Tolerant	<i>None</i>	<i>None</i>





Figure 5-12 Water crossing 13



6.

## DISCUSSION

The thirteen watercourse crossings associated with the proposed development were surveyed visually and kick samples were carried out in those where suitable flow was present. Five crossing points lacked suitable flow, so no kick samples were taken.. These results provide baseline conditions of the water crossings associated with the access roads, collector cable route and turbine delivery route as shown in Table 6-1.

Table 6-1 Water crossing location with Q-scores

Site	Development Infrastructure	Grid Reference (ITM)	Q-value
1	Wind Farm Access Road	E0603848 N0587745	Q3
2	Wind Farm Access Road	E0603329 N0587270	Unsuitable
3	Wind Farm Access Road	E0603092 N0587126	Unsuitable
4	Wind Farm Access Road	E0603177 N0586333	Unsuitable
5	Wind Farm Access Road	E0603336 N0586231	Q3
6	Wind Farm Access Road	E0603667 N0586280	Q3
7	Wind Farm Access Road	E0603738 N0587170	Q4
8	Wind Farm Access Road	E0604334 N0586722	Unsuitable
9	Collector Cable Route	E0601715 N0586371	Q4
10	Collector Cable Route	E0600979 N0586641	Q4
11	Turbine Delivery Route	E0601347 N0584990	Q3-4
12	Turbine Delivery Route	E0601298 N0585047	Unsuitable
13	Turbine Delivery Route	E0601200 N0585150	Q4

7.

## CONCLUSION

The surveys carried out by MKO in 2019 and 2022 provide an up-to-date baseline of conditions of watercourses within and in close proximity to the proposed works which will aid in monitoring any future changes in water quality. The water crossings within the overall proposed development site include nine existing water crossings proposed for upgrade and four proposed new water crossings.

Four of the water crossings of tributaries of the Glendine stream in the eastern section of the proposed development site were typically forestry drains which were either dry or had too little flow to take kick samples. Samples were taken in four streams and in these, Q scores ranged from Q3 to Q4.

Water crossings of the Tourig stream and its tributaries in the southwestern section of the proposed development site were typical headwater streams i.e., typically shallow on steep gradients with variable flow. All but one water crossing in this area had sufficient water to take kick samples, and yielded Q scores from Q3-4 to Q4.

The proposed water crossing works associated with the proposed development have the potential to impact on these habitats, including the Tourig stream, and their associated fauna, via habitat loss, the creation of barriers to the movement of aquatic species, and the deterioration of water quality due to the runoff of pollutants arising from the construction and operational phases of the proposed development. These impacts have, in the absence of best practice and mitigation, the potential to cause significant effects on fauna within and downstream of the proposed development site.

As indicated in the CEMP (Section 3.2.6) and again in the EIAR (Section 7.6.4.1.1), in relation to new water crossings, detailed procedures and mitigations are provided to ensure no significant effects on watercourse habitats or their associated fauna have been provided and include but are not limited to the following: *Proposed new stream crossings will be bottomless or clear span pre-cast bridges and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the watercourse at the proposed crossing locations. Where the proposed underground onsite cabling route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road.*

In relation to water crossings proposed for upgrade, the CEMP (Section 3.2.6) summarizes the mitigations detailed in the EIAR (Section 10.5) that will be followed. The CEMP further details the construction methodology which further ensures no significant effects on watercourse habitats or their associated fauna. This methodology includes:

- The access road on the approach watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- The installation of the culvert will take place in low flow conditions.
- Where a flow exists, the water running through the watercourse channel will be pumped around the water crossing location and back into the watercourse channel downstream of the works area.
- Where over pumping is required, measures will be taken to ensure that the pumped water discharge does not disturb the channel bed with the force of water from the discharge. A steel plate to reduce the force of the flow will be used where appropriate.
- The project engineer will determine the required gradient of the culvert. The culvert must be laid at a gradient that will ensure water is contained within the culvert at all times. Where necessary a rock armour dam will be installed within the channel to reduce flow and ensure an acceptable depth of water remains within the culvert. Where a gradient of 1 – 1.5% is identified, the use of a baffle has been recommended.

- The bed of the watercourse channel will be excavated, if necessary, to achieve the correct line and to allow the culvert to be embedded 300mm into the base of the existing drain.
- The embedded section will be allowed to fill naturally with existing material within the base of the drain or with suitable drainage material such as gravel or round shingle where deemed applicable.
- The culvert will be lowered into place using an excavator with a lifting mechanism.
- Large stone boulders (approx. 400mm), sourced from the on-site borrow pits, will be placed over the culvert to create a headwall for the culvert and a suitable sub-base for road construction.
- Smaller 50mm stone sourced on site will be placed upon the sub-base to construct the road over the water crossing.

Furthermore, all works in relation to water crossings will be undertaken in line with NRA Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes

Following the implementation of best practice and mitigation measures detailed above and, in the CEMP, the proposed new and upgraded water crossings associated with the proposed development will not result in significant effects on watercourse habitats, including the Tourig stream, and their associated fauna. The use of box culverts will ensure riverbanks are retained and no barriers to connectivity will be created, allowing the migration of salmonids and other species up and down stream. Furthermore, following the implementation of best practice construction methodology and mitigations, there is no potential for deterioration in water quality arising from the construction and operational phases of the proposed development.

The proposed water crossings associated with the proposed windfarm development will not result in significant impacts on the Tourig stream, or ex-situ species such as otter and salmonids. No barriers to connectivity or loss of habitat are expected and pathways for deterioration of water quality due to runoff of pollutants have been robustly blocked.

## 8. REFERENCES

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