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ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COUNNAGAPPUL WIND FARM, CO. WATERFORD

Schedule of Commitments

Prepared for:
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TABLE OF CONTENTS

SCHEDULE OF COMMITMENTS.....	1
Introduction.....	1
17.1 EIA Mitigation Measures	2
17.2 EIA Monitoring Measures.....	40

LIST OF TABLES

	<u>Page</u>
Table 1: Schedule of Mitigation.....	2
Table 2: Schedule of Monitoring Measures	40



SCHEDULE OF COMMITMENTS

Introduction

All mitigation and monitoring measures relating to the pre-commencement, construction, operational and decommissioning phases of the Proposed Development are set out in the relevant chapters of this EIAR.

All mitigation which will be implemented during the various phases of the Proposed Development are presented in Table 1, below. The mitigation measures have been grouped together according to their EIAR Chapter and project phase and are presented under the following headings:

- Pre-Commencement Phase;
- Construction Phase;
- Operational Phase;
- Decommissioning Phase.

The mitigation proposals in the below format provides an easy to audit list that can be reviewed and reported on during the future phases of the Proposed Development. The proposal for site inspections and environmental audits are set out in the Construction and Environmental Management Plan (CEMP) which accompany the EIAR. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits.

All monitoring measures which will be implemented during the pre-commencement, construction, operational and decommissioning phases of the Proposed Development are outlined in **Table 1-2**. All monitoring measures were set out in the relevant chapters of this EIAR. The monitoring proposals are presented in terms of the monitoring requirement, frequency of monitoring and the mechanism for reporting results where applicable. By presenting the monitoring proposals in the below format, it is intended to provide a monitoring schedule that can be reviewed and tracked during all phases of the Proposed Development to ensure all the required monitoring is completed as required.

It is intended that the CEMP will be updated where required prior to the commencement of construction to include all mitigations and monitoring measures, conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and will be submitted to the Planning Authority for written approval.



17.1 EIAR Mitigation Measures

Table 1: Schedule of Mitigation

EIAR Section	Development Phase	Mitigation Measure
Chapter 6 - Population and Human Health		
General	Pre-Commencement Phase and Construction	<p>A Construction Environmental Management Plan (CEMP) has been prepared (Appendix 2.1, Volume III) which includes:</p> <ul style="list-style-type: none"> • CEMP Appendix A - Traffic Management Plan • CEMP Appendix B - Grid Connection Construction Methodology • CEMP Appendix C - Peat and Spoil Management Plan • CEMP Appendix D - Surface Water Management Plan <p>The CEMP and appendices will be adopted by the appointed Contractor for the construction of the Proposed Development.</p>
6.8.3	Pre-Commencement Phase	<p>Land Use</p> <p>The area of trees to be felled will be minimised to only that required to accommodate the Proposed Development.</p> <p>The public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period.</p> <p>Prior to the grid connection installation works within public roads residents and businesses that might be temporarily effected (e.g. impediment to access) will be consulted to determine how best to accommodate them during the works. All proposed works and deliveries along the TDR route will also be controlled by a Construction and Environmental Management Plan to avoid undue impact to adjacent land uses.</p>
6.8.4	Pre-Commencement Phase	<p>Recreation, Amenity and Tourism</p>



EIAR Section	Development Phase	Mitigation Measure
		Mitigation measures to avoid impacts to recreational facilities such as trails and scenic drives includes the distribution of signage and maps of alternative routes to reduce the effect on tourists and local users of the Comeragh Trails.
6.8.5.1	Construction and Decommission Phase	<p>Mitigation Measures – Construction & Decommissioning</p> <p>The construction site will be closed to the public for the 24-month construction period as well as the decommissioning period. This measure aims to avoid potential injury to members of the public as a result of construction activities.</p> <p>Appropriate warning signage will be posted at the construction site entrance, directing all visitors to the site manager. Appropriate warning signage shall be provided on public roads approaching site entrances and along haul routes including clear signage relating to the development, both temporary and permanent will be provided for accessing the site.</p> <p>In relation to the TDR, extra safety measures must be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan must be utilized to avoid potential impact to human safety for road users and pedestrians.</p> <p>For the installation of the grid connection cable in the public road, a detailed traffic management plan as part of the CEMP shall be finalized following the appointment of the contractor for the main construction works and turbine supply contract which will plan shall be developed in discussion with locals who will be directly impacted by the works, and in agreement with the Local Authority.</p>
6.8.5.2	Operational Phase	<p>All personnel undertaking work in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.</p> <p>Equipment within high voltage substations presents a potential hazard to health and safety. The proposed substation will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.</p> <p>All electrical elements of the Proposed Development are designed to ensure compliance with EMF standards for human safety.</p>



EIA Section	Development Phase	Mitigation Measure
		<p>All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.</p> <p>All personnel undertaking work in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.</p> <p>Equipment within high voltage substations presents a potential hazard to health and safety. The proposed substation will be enclosed by palisade fencing and equipped with intruder and fire alarms in line with ESB and EirGrid standards.</p> <p>All electrical elements of the Proposed Development are designed to ensure compliance with EMF standards for human safety.</p> <p>All on-site electrical connections are carried by underground cable and will be marked out above ground where they extend beyond the track or hardstanding surface. Details of cables installed in the public road will be available from ESBN.</p> <p>Design includes a glass fibre reinforced polyester hood that covers the nacelle. The turbines will be equipped with a Lightning Protection System (LPS) earthing and isolation to help protect the wind turbine against the physical damage caused by lightning strikes. Additionally, the turbines can be equipped with a Fire Suppression System. Furthermore, the wind farm will be remotely monitored, and potential accidents will be quickly identified and reported.</p> <p>Furthermore, a nominated competent person will carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.</p> <p>In line with WEI Health and Safety Guidelines for the Onshore Wind Industry (2011), Emergency Response Plans will include emergency response procedures for initial actions in the event of a fire. Records will be kept for testing of fire alarms and drills and maintenance/inspection of fixed and portable firefighting equipment.</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>Information will be provided to employees on fire safety and fire prevention, including risks of and control measures to prevent fire outbreak, evacuation procedures and those responsible for their implementation, and the use of firefighting equipment, in line with HSA guidance (Fire Prevention - Health and Safety Authority (hsa.ie). The wind farm system will include a kill switch that can be operated at any time with an overriding manual shutdown system in case of an emergency.</p> <p>During the construction phase of the Proposed Development, an emergency response plan will be in place as set out in Section 6 of the CEMP, included in Appendix 3.1 of Volume 3 of this EIAR.</p> <p>Turbines will be fitted with a Fire Suppression System. Additionally, each turbine will have a number shown in large print on the top of the nacelle which is intended to aid in any aerial fire support to control wildfires which are known to occur at the Comeragh Mountains.</p> <p>Lightning conductors will be installed on each turbine as all structures standing tall in the sky require this protection. Turbines specifically require this to prevent power surges to electrical components.</p> <p>Turbines will be fitted with ice detection systems which will stop the turbine from rotating if ice is forming on a turbine blade. This aims to prevent ice throwing which can cause injury.</p> <p>24-hour remote monitoring and fault notifications will be included as standard in the Turbine Operations and Maintenance Contracts.</p> <p>In addition to scheduled maintenance, the maintenance contracts will allow for call out of local engineers to resolve any issues as soon as they are noticed the remote monitoring system.</p> <p>Access to the turbines inner structure will be locked at all times and only accessed by licensed employees for maintenance.</p> <p>Risk avoidance by design such as a detailed design risk assessment at detailed design stage, a detailed method statement for all elements of the work, supervision by geotechnical personnel during excavation and avoidance of earthworks during severe weather conditions.</p>



EIA Section	Development Phase	Mitigation Measure
		<p>During the construction phase of the Proposed Development, an emergency response plan will be in place as set out in Section 6 of the CEMP in the unlikely event of a landslide/slope failure.</p> <p>In line with the Health Service Executive’s Emergency Planning recommendations, any incident which may occur at the site which requires emergency services, incident information will be provided in the ‘ETHANE’ format.</p> <ul style="list-style-type: none"> • Exact location; • Type of incident; • Hazards; • Access and egress; • Number of casualties (if any) and condition, and • Emergency services present and required. <p>Shadow flicker detection systems will be installed on all turbines in order to reduce potential occurrence of shadow flicker on nearby receptors.</p> <p>The wind farm system shall include a kill switch that can be operated at any time with an overriding manual shutdown system in case of an emergency.</p>
Chapter 7 - Air Quality & Climate		
7.5.1 - Air	Construction Phase	<p>The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate which compacts, preventing dust;</p> <p>A water bowser will be available to spray work areas (wind turbine area and grid connection route) and haul roads, especially during periods of excavations works coinciding with dry periods of weather, in order to suppress dust migration from the site;</p>



EIA Section	Development Phase	Mitigation Measure
		<p>All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;</p> <p>Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable;</p> <p>The access and egress of construction vehicles will be controlled and directed to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;</p> <p>Construction vehicles and machinery will be serviced and in good working order;</p> <p>Wheel washing facilities will be provided within the site near the site entrance point of the Site as described in Chapter 2;</p> <p>The developer in association with the contractor will be required to implement the dust control plan as part of the CEMP. In the event the Planning Authority decides to grant permission for the proposed development, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority.</p> <p>Receptors which have the potential to receive dusting and soiling temporary works at TDR nodes located adjacent to dwellings; and dwellings directly adjacent to the GCR construction that experience dust soiling, where appropriate, and with the agreement of the landowner, will have the facades of their dwelling cleaned if required should soiling occur;</p> <p>Ensure all vehicles switch off engines when stationary – no idling vehicles; and</p> <p>Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.</p>



EIAR Section	Development Phase	Mitigation Measure
7.5.1 - Air	Decommissioning Phase	Mitigation measures for the removal of wind turbines and all other site works from the proposed development site will be the same as the construction phase with respect to dust control and minimisation. As proposed, the access tracks across the Site will be left in situ and utilised as forest roads following decommissioning and no mitigation measures are proposed. In terms of the underground grid cable and substation, it is proposed these will be left in situ and so no mitigation measures are proposed.
Chapter 8 - Noise & Vibration		
8.7.1	Construction Phase	<p>Construction works traffic will generally be restricted to movements along access routes to the standard working hours and exclude Sundays, unless specifically agreed otherwise with the Local Planning Authority. For example, during turbine erection, an extension to the working day may be required, i.e. 05:00 to 21:00, but this would be necessary only on a relatively small number of occasions. If turbine deliveries are required at night, it will be ensured that vehicles on local roads do not wait outside residential properties with their engines idling, and that the local residents will be informed of any activities likely to occur outside of normal working hours.</p> <p>Consultation with the local community is important in minimising the effects and therefore construction will be undertaken in consultation with the Local Planning Authority as well as the residents being informed of construction activities.</p> <p>The construction works on site will be carried out in accordance with the guidance set out in BS 5228:2009+A1:2014, and the noise control measures set out within the Construction Environmental Management Plan (CEMP) for this project. Proper maintenance of plant will be employed to minimise the noise produced by any site operations.</p> <p>All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the Project. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays. However, to ensure that optimal use is made of fair-weather windows, or at critical periods within the programme, it could occasionally be necessary to work outside these hours. Any such out of hours working would be agreed in advance with the Local Planning Authority.</p> <p>The on-site construction and decommissioning noise levels will be below the relevant noise limit of 65 dB LAeq,1hr for operations exceeding one month, and therefore construction noise effects are not considered to be significant. However, there is potential for temporary elevated noise levels due to the grid connection works. However, the effect of these works at any particular receptor will be for a short duration (i.e. less than 3 days). Where the works at elevated noise levels are required over an extended period at a given location, a temporary barrier or screen will be used to reduce noise levels below the noise limit where required. The noise effect will also be minimised by limiting the number of plant items operating simultaneously where reasonably practicable.</p>
8.7.3	Decommissioning Phase	<p>The noise effect for decommissioning works will be similar to that generated during the construction works, where noise generated during construction works will be within the current noise limits. It is proposed the grid connection works will be left in situ post decommissioning.</p> <p>The decommissioning works will be of a lower effect than construction works as the turbine components can be dismantled on site and removed using standard HGVs. Decommissioning works will be carried out in accordance with the policies and guidance required at the time of the works, and restricted to normal working hours, 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 on Saturdays in accordance with best practice.</p>
Chapter 9 - Biodiversity		
8.10.2	Construction Phase	<p>A Project Ecologist/Ecological Clerk of Works (ECoW) will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/EcoW will advise on environmental effects and communicate with the project owner and contractor to ensure the required actions to implement the mitigation prescribed in this EIAR are carried out.</p>



EIA Section	Development Phase	Mitigation Measure
		<p>The area of the proposed works will be kept to the minimum necessary, including all Site clearance works, to minimise disturbance to habitats and flora.</p> <p>Machinery, and equipment will be stored within the Site compound. Designated access points will be established within the Site and all construction traffic will be restricted to these locations. Access to the Site will be primarily via the existing unnamed local road to the west of the Site. HGVs shall approach the Site via this road.</p> <p><u>Hedgerow a Reinstatement at TDR PoI 24</u></p> <p>Vegetation removal is required which could have a Long-term Significant Reversible impact. This is primarily due to the presence of sections of good-quality mature hedgerow along this part of the TDR which may be removed or damaged as a result of TDR PoI works. Therefore, as a mitigating action, hedgerows removed or lowered by TDR PoI works will be reinstated using the same native species present in original hedgerows: Hawthorn, Grey Willow, Rowan. Note Ash <i>Fraxinus excelsior</i> is not proposed to be used, due to its vulnerability to ash dieback disease. Semi-mature specimens of native provenance will be included to accelerate rehabilitation.</p> <p>All hedgerow planting is required to use plants of native provenance (local if possible). Locally sourced willow cuttings are suitable where this genus is specified.</p> <p><u>Management of the spread of non-native invasive Species</u></p> <p>According to Invasive Species Ireland (ISI) invasive non-native species are the second greatest threat (after habitat destruction) to worldwide biodiversity. Invasive species negatively impact Ireland’s native species; changing habitats and ultimately threatening ecosystems which impacts on biodiversity as well as economics as they are costly to eradicate.</p> <p>Halting the spread of non-native invasive species at the Site, GCR and TDR will be achieved via prevention, containment, treatment and eradication.</p>



EIA Section	Development Phase	Mitigation Measure
		<p><u>Invasive Species</u></p> <p>Prior to trimming or vegetation removal along the grid connection an invasive species survey will be undertaken to reconfirm the findings of the EIA. Containment and eradication measures are detailed in the Invasive Species Management Plan (Appendix 9.2, Volume III) which will be used as required where avoidance of invasive species is not possible.</p> <p><u>Mammals</u></p> <p>An ecologist will supervise areas where vegetation removal and tree felling will occur prior to and during construction as appropriate (e.g., an ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any Site-specific issues in relation to wildlife not currently present (Badger setts, Red squirrel dreys, Pine marten dens) on Site will be reconfirmed prior to commencement of works so as to allow appropriate mitigation measures to be put in place.</p> <p>In the event that the aforementioned mammals, or their resting places are recorded, the consenting authority will be updated, consulted with, relevant guidelines will be followed for the management of such species.</p> <p>Construction operations will take place predominantly during the hours of daylight to minimise disturbances to faunal species at night. Some works along the grid connection route and wind farm Site may occur at night but the project ecologist/ECOW will limit night-time works to sections of the route / Site which avoid sensitive features (e.g. forestry edges, mature treelines).</p> <p><u>Badgers</u></p> <p>There is the potential for setts to be discovered during vegetation clearance works. Care will be taken during this early stage of the development and a competent ecologist will be on-Site for these works. If setts are discovered all works within 30m of the sett will cease including vegetation clearance. The consenting authority will be contacted and measures to manage the species confirmed.</p>



		<p>Red Squirrel</p> <p>Where possible, any required felling of trees in forestry areas will be limited to time periods outside which Red Squirrel may have young in dreys (peak period January to March).</p> <p>If this is unavoidable then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied dreys are present. Suitable mitigation measures comprising a derogation/disturbance licence will be sought if dreys are found within the felling footprint or adjacent areas.</p> <p>Pine Marten</p> <p>Where possible, felling of trees in forestry areas will be limited to time periods outside which pine martens may have young in dens (March and April). If this is unavoidable, then areas to be clear felled will be surveyed in advance by a suitably qualified ecologist to determine whether any occupied pine marten dens are present. Suitable mitigation measures comprising a derogation/disturbance licence will be sought if dens are found within the felling footprint or adjacent areas.</p> <p>Bats</p> <p>101m Buffers will be maintained throughout the lifetime of the wind farm as tree-free areas around each turbine. This will be achieved through mechanical means only; the use of chemical substances is prohibited.</p> <p>An ecologist/ECOW will supervise areas where vegetation, scrub and hedgerow removal will occur prior to and during construction as appropriate (e.g., ecologist may be required during some clearance works of areas where vegetation is too dense to check beforehand). This will ensure that any Site-specific issues in relation to wildlife not currently present (e.g., Bat roost locations) on Site will be discovered prior to commencement of works to allow appropriate mitigation measures to be put in place. In the unlikely event that a bat roost is found, the NPWS will be informed and the relevant guidelines will be implemented as appropriate (e.g. NRA guidelines).</p> <p>Existing hedgerows and semi-natural scrub or semi-natural grasslands within the Site outside of the footprint of the development will be retained. Disturbed areas will be allowed to recolonise naturally.</p>
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EIA Section	Development Phase	Mitigation Measure
		<p>A native broadleaf treeline will be planted within the agricultural lands adjacent to Temporary Construction Compound # 2 which will comprise Pedunculate Oak, Alder, Hawthorn, Rowan, and Grey Willow (refer to Figure 9.6, Volume IV). This will enhance feeding opportunity for bats.</p> <p>Construction operations within the wind farm Site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works along the cable route and wind farm Site may occur at night but the project ecologist/ECOW will limit night-time works to sections of the route / Site which avoid sensitive features (e.g. mature treelines, conifer plantation edge and tracks). Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) will be used to prevent overspill.</p> <p>This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.</p> <p><u>Other Species</u></p> <p>In the event that construction is required to proceed during the breeding season of common frog (approximately January – midsummer), a preconstruction amphibian survey will be completed and translocation under licence will be required where active breeding drains are within the development footprint.</p> <p>Protection of existing hydrological conditions where drains are adjacent to or within the zone of influence (i.e. could be impacted by drainage works elsewhere) is required. In the event that the hydrology of existing breeding areas within the zone of influence cannot be maintained, translocation to suitable receptor Sites will be used.</p>
8.10.3	Operational Phase	<p><u>Invasive Species</u></p> <p>Invasive species will continue to be monitored, and where required, treated within the project area according to the invasive species management plan for as long as they persist within the Site (Appendix 9.2).</p> <p><u>Bats</u></p>



		<p>Feathering of Blades</p> <p>Turbines will operate in a manner which restricts the rotation of the blades as far as is practicably possible below the manufacturer's specified cut-in speed (SNH 2021). This is achieved by feathering the blades during low wind speeds; the angle of the blades is rotated to present the slimmest profile possible towards the wind, ensuring they do not rotate or 'idle' when not generating power.</p> <p>Turbine blades spinning in low wind can kill bats, however bats cannot be killed by feathered blades which are not spinning (Horn et al., 2008). The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50% (SNH 2021).</p> <p>As such, the feathering of blades to prevent 'idling' during low wind speeds is proposed for all turbines.</p> <p>Cut-in Speeds/Curtailment</p> <p>Increasing the cut-in speed above that set by the manufacturer can reduce the potential for bat/turbine collisions. A study by Arnett <i>et al.</i>, (2011) showed a 50% decrease in bat fatality can be achieved by increasing the cut-in speed by 1.5 m/s.</p> <p>Species with elevated risk of collision (Leisler's bat, soprano and common pipistrelle) in particular would benefit from increasing the cut-in speed of turbines, as dictated on a case-by case basis depending on the activity levels recorded at each turbine.</p> <p>While bat activity varied considerably by species, T06 and T07 had a High risk of impact to High Risk species, with the remaining turbine locations all having Medium risk of impact. Therefore, increased cut-in speeds will be implemented for all turbines from commencement of operation. Cut-in speeds will be increased during the bat activity season (April-October) and/or where weather conditions are optimal for bat activity (see below) from 30 minutes prior to sunset and to 30 minutes after sunrise at all turbines.</p> <p>Cut-in speeds restrictions will be operated according to specific weather conditions:</p> <ol style="list-style-type: none">1. When the air temperature is above approximately 10 to 11°C at nacelle height; and2. Where the wind speed range is between 5.0 to 6.5m/s (at nacelle height).
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EIA Section	Development Phase	Mitigation Measure
		<p>Due to the considerable unnecessary down time resulting from the proposed “blanket curtailment” (above) and the advances in smart curtailment, a focused curtailment regime is proposed as described below from year four of operation. This will focus on times and dates, corresponding with periods when the highest level of bat activity occur within the Site. This includes the use of the SCADA (Supervisory Control and Data Acquisitions) operating system (or equivalent) to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.</p> <p>Post-construction surveys will be undertaken for the first three years of operation to confirm if blanket curtailment restrictions can be amended in line with post-construction activity levels.</p> <p>The post construction surveys will be used to update the current curtailment regime (blanket curtailment) designed around the values for the key weather parameters and other factors that are known to influence collision risk. This will include all of the following:</p> <ul style="list-style-type: none"> • Wind speed in m/s (measured at nacelle height) • Time after sunset • Month of the year • Temperature (°C) • Precipitation (mm/hr) <p><u>Enhancement Measures</u></p> <p>A series of enhancement measures are proposed to increase the biodiversity value of the proposed Site. These are detailed in the Biodiversity Enhancement & Management Plan (see Appendix 9.1, Volume III).</p>



EIA Section	Development Phase	Mitigation Measure
8.10.4	Decommissioning Phase	The same mitigation measures for the wind farm and GCR will apply for the decommissioning phase as for the construction phase.
Chapter 10 - Ornithology		
9.6.2	Construction Phase	<p>A Project Ecologist/Ecological Clerk of Works (ECoW) with appropriate experience and expertise (in implementing ecological mitigation measure for wind farm developments) will be employed for the duration of the construction phase to ensure that all the mitigation measures outlined in relation to the environment are implemented. The Project Ecologist/ECoW will be awarded the authority to stop construction activity if there is potential for significant adverse ecological effects to occur.</p> <p>The removal of vegetation and scrub as well as trimming of trees along the TDR and Site will be undertaken outside of the bird breeding season (March 1st to August 31st inclusive).</p> <p>Construction operations will take place during the hours of daylight to minimise disturbances to roosting birds, or active nocturnal bird species. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006). Limited operations such as concrete pours, turbine erection and installation of the grid connection may require night-time operating hours; these works will be supervised by the project ecologist/ECoW.</p> <p>Toolbox talks will be undertaken with construction staff on disturbance to key species during construction. This will help minimise disturbance. This is in line with best practice recommendations for mitigation measures with regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).</p> <p>Where removed or altered at TDR Nodes, re-instated hedgerows will be planted with locally sourced native species. This will result in habitat enhancement for local species of conservation importance such as meadow pipit. This is in line with best practice recommendations for mitigation measures in regard to birds and wind farms as recommended by statutory bodies such as English Nature and the Royal Society for the Protection of Birds (Drewitt and Langston, 2006).</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>A re-confirmatory pre-construction survey (March/April) will be conducted of the proposed turbine locations to assess any evidence of target species activity or occupation of new territories (e.g. in the case of breeding snipe). Should any nesting locations be recorded, works at these locations will be restricted to outside the breeding season (March 1st to August 31st inclusive) or until chicks are deemed to have fledged (following monitoring).</p> <p>The use of “white lights” on the turbines will not occur as these can attract night flying birds such as migrants, and insects, which in turn can attract bats. Certain turbines will be illuminated with medium intensity fixed red obstacle lights of 2000 candelas where required by the IAA Lighting will be fitted with baffles to ensure that the light is directed skywards and will not be discernible from the ground.</p>
9.6.3	Decommissioning Phase	<p>The decommissioning phase of the Proposed Development poses similar risks to potential effects vis-à-vis the construction phase. However, it should be noted that the magnitude of the effect of decommissioning is reduced as all infrastructure is already in situ. No works will be required along the haul route as the turbine components will be broken up on site and therefore require less clearance to remove along the same haul road. It is proposed that the grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.</p>
Chapter 11 - Soils, Geology and Hydrogeology		
	Pre-Commencement Phase	<p>The following will be implemented:</p> <ul style="list-style-type: none"> • Any excavation and construction related works will be subject to a design risk assessment at detailed design stage to determine risk levels for the construction, operation and maintenance and decommissioning of the works. Identified impacts will be minimised by the application of principles of avoidance, prevention and protection. Information on residual impacts will be recorded. • Given that the works comprise a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on Site to supervise the works. • A detailed method statement for each element of the works will be prepared by the Contractor prior to any element of the work being carried out. These method statements shall be reviewed and approved by a qualified geotechnical engineer.



EIAR Section	Development Phase	Mitigation Measure
		<ul style="list-style-type: none"> The Contract will require programming of the works such that earthworks are not scheduled during severe weather conditions. Where such weather is forecast, suitable measures will be taken to secure the works.
	Construction Phase	<p><u>Site Clearance</u></p> <p>Best practices will be employed in the prevention of silt laden run-off from entering watercourses as discussed in Chapter 12. Best practice measures included in the design will include sediment control in the form of swales, interceptor ditches and settlement ponds. Additional standard construction management will be employed such as CIRIA C648 (Control of water pollution from linear construction projects), CIRIA C532 (Control of water pollution from construction sites) and CIRIA C753 (SuDS Manual).</p> <p>The use of plant and machinery during worksite clearance works and throughout the construction will require the storage and use of fuels and oils, which will only be stored at the construction compound areas in designated bunded areas. Details of oil spill protection measures adjacent to sensitive receptors and emergency spill response procedures are outlined in the CEMP, which is contained in Appendix 2.1 of Volume III.</p> <p>Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled.</p> <p>Refuelling will be carried out using fuel trucks, which will bring fuel to the felling plant and equipment. Specific mitigation measures relating to the management of hydrocarbons are as follows:</p> <ul style="list-style-type: none"> Any diesel, fuel or hydraulic oils stored on Site will be stored in bunded storage tanks – the bund area will have a volume of at least 110 % of the volume of such materials stored. Appropriately sized plant nappies will be used for all mobile equipment e.g. generators and pumps. Emergency drip trays and spill kits will be kept available on Site, to ensure that any spills from vehicles are contained and removed off Site. The emergency response procedure is provided in the CEMP Only designated trained operators will be authorised to refuel plant on Site Taps, nozzles and valves will be fitted with locking systems.



		<p>Earthworks</p> <p>The Site will be constructed in a phased manner to reduce the potential impacts of the Project on the Soils, Geology and Hydrogeology. Phased construction reduces the amount of open, exposed excavations at any one time. Given that the works comprises a significant proportion of excavation and earthworks, suitably qualified and experienced geotechnical personnel will be required on site to supervise the works.</p> <p>All excavated overburden will be retained on-site. This will include:</p> <ul style="list-style-type: none">• Use of suitable Site won material (crushed rock) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.• Surplus overburden will be re-used on Site in the form of landscaping and for reinstatement purposes at the proposed borrow pit. <p>Surplus overburden deposits excavated during the course of the works will be temporarily stored adjacent to the construction phase excavations prior to reuse.</p> <p>Some temporary stockpiles (not exceeding 2m in height) of material will be necessary adjacent to the excavation areas prior to reinstatement, however no long-term stockpiles of material will remain after construction and no surplus/waste soil or rock will be removed from Site. Temporary stockpiles will be shaped and sealed to prevent the ingress of water from rainfall.</p> <p>To mitigate against the compaction of soil at the Site, prior to the commencement of any earthworks, the work corridor will be pegged, and machinery will stay within this corridor so that soils outside the work area are not damaged. Excavations will then be carried out from access tracks as they are constructed in order to reduce the compaction of soft ground.</p> <p>To mitigate against erosion of the exposed soil or rock, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events (>10mm/hour). To mitigate against possible contamination of the exposed soils, bedrock and groundwater..</p>
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EIA Section	Development Phase	Mitigation Measure
		<p>Soil excavated from trenches along the proposed grid connection route will be taken to a licenced facility for disposal or recycling where required. If feasible, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers. The lower engineered fill layers will be reused. The tarmac/asphalt layers will be taken to a licenced facility for disposal or recycling.</p> <p>All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Gravel fill will be used to provide additional support to temporary cuts/excavations where appropriate. Unstable temporary cuts/excavations will not be left unsupported. Where appropriate and necessary, temporary cuts and excavations will be protected against the ingress of water or erosion.</p> <p>Control of Sediment Laden Runoff</p> <p>To minimise the impact to surface water quality, existing drainage (including forestry drainage) will be maintained outside the immediate Site area, and where appropriate, additional Site drainage and settlement ponds will be installed as required prior to construction activities. Silt fencing will be installed in new drainage and monitoring of water quality undertaken during the construction phase.</p> <p>Final drainage will be constructed following the completion of these activities with silt fencing maintained until such time as a vegetation cover has become established..</p> <p>Measures for Spills</p> <p>Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of construction vehicles will be carried out from these tanks or from delivery vehicles at designated refuelling areas. Specific mitigation measures relating to the management of hydrocarbons are as follows:</p> <ul style="list-style-type: none"> • Fuels, lubricants and hydraulic fluids for equipment used on the Site shall be carefully handled to avoid spillage. • Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained, and the contaminated soil removed from the Site and properly disposed of;



EIA Section	Development Phase	Mitigation Measure
		<ul style="list-style-type: none"> • Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the Site for disposal or re-cycling; and • Appropriate spill control equipment, such as oil soakage pads, shall be kept within the construction area and in each item of plant to deal with any accidental spillage. <p>Slope Stability</p> <p>With regard to slope stability, detailed design and construction phase best practice will be implemented as follows:</p> <ul style="list-style-type: none"> • The works will be designed and supervised by a suitably qualified and experienced geotechnical engineer or engineering geologist, and hydrologist or drainage engineer. • Drainage infrastructure will be put in place in advance of turbine excavations. Drains will divert surface water and groundwater away from excavations into the proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will be avoided. • Loading or stockpiling on the surface of soft ground will be avoided. Loading or stockpiling on other deposits will not be undertaken without first establishing the adequacy of the ground to support loads by an appropriately qualified geotechnical engineer experienced in construction within upland conditions. • Turbines located in areas adjacent to peat deposits will incorporate drainage measures such that surface water will be drained away from the peat and will not be allowed to collect adjacent to the peat mass. However, it should be noted that the deepest peat deposits adjacent to a turbine attained a depth of 0.35m (located at turbine T06). • Excavation will be carried out from access roads or hardstanding areas to avoid tracking of construction plant across areas of soft ground/peat. • A detailed assessment of the stability of conditions at proposed infrastructure locations will be undertaken by a suitably qualified and experienced geotechnical engineer prior to the commencement of all excavations to ensure these activities do not result in or contribute to slope failure. • Blasting of rock will not be permitted.



EIA Section	Development Phase	Mitigation Measure
		<ul style="list-style-type: none"> • Excavations which could have the potential to undermine the up-slope component of an existing slope will be sufficiently supported to resist lateral slippage and careful attention will be given to the existing drainage. • Earthworks will not be commenced when heavy or sustained rainfall (status orange or higher) is forecast by Met Eireann. A rainfall gauge will be installed on Site to provide a record of rainfall intensity. An inspection of Site stability and drainage by the Geotechnical Engineer will be carried out on Site when a daily rainfall of over 25mm is recorded on Site, works will only recommence after heavy rain with the prior approval of the Geotechnical Engineer following their inspection. <p>Prior to the progression of the project to detailed design and to inform the detailed design of the Project, the developer shall also ensure that:</p> <ul style="list-style-type: none"> • Confirmatory ground investigation works are undertaken, and these should be tailored to the engineering requirements of the Project. • The Project will be developed to full detailed design prior to construction to minimise the risk of ground instability. • Adequate time is afforded to any designers or contractors involved in the execution of the confirmatory ground investigation works; detailed design and construction works. <p>Groundwater</p> <p>To mitigate against the increased vulnerability of the underlying aquifer to groundwater pollution, all excavations will be constructed and backfilled as quickly as possible. Excavations will stop during or prior to heavy rainfall events (status orange or higher).</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>The dewatering of the foundation excavations is not expected to cause interference with domestic wells in the area, due to large offset distances to known wells, relatively shallow depths of excavation and temporary short-term nature of dewatering, if required. To monitor groundwater during the construction phase groundwater monitoring wells will be installed between areas of deeper excavations and sensitive groundwater receptors, such as areas of shallow bedrock. The wells will be used to monitor groundwater levels and quality to assess any potential impacts during the construction works.</p> <p>Grid connection and internal cable trenches could provide preferential pathways for groundwater and contaminant movement. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods, to avoid acting as a conduit for surface water flows. To further mitigate the risk of cable trenches becoming preferential pathways, clay plugs (or other low permeability material) will be installed at intervals along the trench to stop/inhibit water movement.</p>
	Operational Phase	<p>There is a low risk to the geology receptors from compaction of soils due to the movement of HGVs and maintenance vehicles. All site traffic will be limited to access tracks, thereby reducing the area over which compaction of the underlying natural soils can occur.</p> <p>The main potential impact during the operation phase will be the risk to groundwater from contamination from spills. Storage tanks, used to store fuel for the various items of machinery, will be self-contained and double-walled. Refuelling of maintenance vehicles will be carried out from these tanks or from delivery vehicles. Specific mitigation measures relating to the management of hydrocarbons will be implemented as follows:</p> <ul style="list-style-type: none"> • Fuels, lubricants and hydraulic fluids for equipment used on the Proposed Development shall be carefully handled to avoid spillage. <p>Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained, and the contaminated soil removed from the Proposed Development and properly disposed of at a licenced waste facility;</p> <ul style="list-style-type: none"> • Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the Proposed Development site for disposal or re-cycling at a licenced waste facility; and • Appropriate spill control equipment, such as oil soakage pads, will be kept within the storage areas and in each item of plant / vehicle to deal with any accidental spillage.



EIA Section	Development Phase	Mitigation Measure
	Decommissioning Phase	<p>Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant.</p> <p>Some of the impacts associated with reinstatement of the Proposed Development site (excavation of turbine bases, access tracks etc.) will be avoided by leaving these in place where possible. The Irish Wind Energy Association (IWEA) (11) states that when decommissioning a wind farm “the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance”. It is proposed to leave the access tracks in-situ at the decommissioning stage. IWEA also state that “it may be best” to leave site tracks in-situ depending on the size and geography of the Proposed Development.</p> <p>It is considered that leaving the turbine foundations, access tracks and hardstanding areas in-situ will cause less environmental damage than removing and recycling them. It is proposed to retain these elements of the construction and cover with overburden material (which will have been placed at the sides of roads and hardstanding to turbines) to allow for re-vegetation of the Proposed Development Site.</p> <p>However, if removal is deemed to be required by the respective Planning Authority all infrastructure will be removed with mitigation measures similar to those during construction being employed.</p> <p>Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures outlined above.</p>
Chapter 12 - Hydrology and Water Quality & FRA		
12.12.1	Pre-Commencement Phase	<p>A process of 'mitigation by avoidance', as informed by constraints assessment and consultation, was undertaken by the EIA team during the design of the wind farm layout and selection of grid connection route (refer to Chapter 3 - Site Selection and Alternatives for further detail) with the objective of avoiding / minimising the potential for significant effects on water quality and hydrology. The Proposed Development layout and drainage infrastructure has been designed such that it is sympathetic to the existing topography and aims to maintain the existing hydrological regime of the Proposed Development such that it does not create a changed hydrological response to precipitation.</p> <p>The infrastructure has been located such that it is set back as far as reasonably practicable from hydrological features, with an ethos of achieving a minimum setback of 75m between mapped surface waters and wind farm infrastructure, and a minimum setback of 15m from non-mapped streams and drainage features with the exception of HDD locations and watercourse crossings. Objective BD17 of the Waterford City and County Development Plan 2022-2028 requires that a buffer zone of at least 15m is maintained between the Proposed Development works and the top of the riverbank.</p>



EIA Section	Development Phase	Mitigation Measure
		<p>The GCR that was selected aims to limit the number of watercourse crossings and to cross by HDD where feasible in order to limit interaction with the watercourse and to protect riparian habitat.</p> <p>A Surface Water Management Plan for the construction, operation and decommissioning stages of the Proposed Development is contained in Volume IV, Appendix 12.1. The proposed drainage design will:</p> <ul style="list-style-type: none"> • Collect surface water runoff upgradient of the Proposed Development via interceptor drains and will redistribute this 'clean' collected runoff downgradient of the Proposed Development by means of cross drains which will release via diffuse outfalls to vegetated areas (within the same catchment) or will divert the runoff back into the existing network serving the catchment. This drainage design aims to maintain the hydrological regime of the Proposed Development. • Collect surface water runoff from the footprint of the Proposed Development (during construction, operation and decommissioning) and discharge diffusely to adjacent vegetated areas via settlement ponds, with a view to protecting water quality. <p>Attenuation and Flood Risk</p> <p>The Proposed Development will increase the impermeable area within the Proposed Development and as such can potentially increase the rate and volume of surface water runoff in response to precipitation events. Mitigation measures to address surface water runoff and drainage include in line attenuation features such as check dams and stilling ponds and diffuse outfalls with a view to maintaining the baseline hydrological regime and to provide attenuation at greenfield run-off rates.</p> <p>All access tracks will be constructed from aggregate which will allow a portion of rainfall to infiltrate and, therefore, reduce surface water runoff. Adjacent swales will also intercept and retain surface water runoff allowing this to disperse naturally via infiltration and evapotranspiration. Where swales are installed on sloped ground, check dam structures will be used within the channels to provide attenuation, allowing a portion of the flows to disperse naturally.</p> <p>Swales and drainage channels will discharge runoff from access roads and areas of hardstanding to settlement ponds. These will be suitably sized to accommodate flows from storm events up to and including the 1 in 100-year storm event. Settlement ponds will not discharge directly to any drain or watercourse. Rather, flows from the ponds will be dispersed diffusely over land to allow natural overland flow and percolation within the catchment.</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>Watercourse crossings will be designed and suitably sized to accommodate peak, or storm discharge rates so as not to cause risk of impeding flows during extreme storm events and causing flooding upstream of the crossing. All drain and watercourse crossings will be designed in accordance with the requirements of Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010. The channel width will be maintained, and the crossings will be designed so as not to cause an impediment to the passage of woody debris or sediment transport. Appropriate freeboard will be provided to OPW requirements.</p> <p>The cable trenches will be excavated in dry weather where possible and infilled and revegetated if required to prevent soil erosion or generation of silt pollution of nearby surface water. There will, therefore, be no increase in the risk of flooding.</p> <p>The surface water management system at the Proposed Development will ensure that there will be no increase in the risk of fluvial or surface water flooding downstream as a result of the windfarm development.</p>
12.12.3	Construction Phase	<p>The mitigation measures prescribed are aimed at ensuring no deterioration in WFD status waterbodies within the catchments of the Proposed Development, noting that the rivers have High Status objectives and are included in the Blue Dot Programme. Strict mitigation measures in relation to maintaining a high quality of surface water runoff from the Proposed Development will ensure that the status of surface waterbodies is not affected.</p> <p>Best practice construction methods will be used to avoid potential for effects on water quality and hydrology following the documents and guidelines listed below:</p> <ul style="list-style-type: none"> ○ Water Run-Off from Construction Sites - SEPA - (WAT-SG-75) ○ The SUDS Manual - CIRIA C697. ISBN 0 86017 697 5 ○ Site Handbook for the Construction of SUDS - CIRIA C698 ISBN 0 86017 698 3. ○ Works and maintenance in or near water - PPG5 - (October 2007) ○ Environmental good practice on site guide (fourth edition) (C741) ○ Guidance for Pollution Prevention, dealing with spills: GPP 22-(October 2018) ○ Temporary Construction Methods - SEPA -(WAT-SG-29) ○ Guidelines on protection of Fisheries During Construction Works in and Adjacent to Waters - Inland Fisheries Ireland - (IFI 2016) ○ Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes - TII Publications (2008)



EIA Section	Development Phase	Mitigation Measure
		<p>Further environmental best practice measure for key parts of the construction phase is outlined in more detail in the Construction Environmental Management Plan CEMP (Appendix 2.1, Volume III).</p> <p>Control of Accidental Spills and Leaks</p> <p>Regarding good practice associated with mitigating the risk of hydrocarbon release during construction, as stated in the SWMP, construction vehicles will be refuelled off-site, wherever possible. This will primarily be the case for road vehicles such as vans and trucks. Refuelling of mobile plant during construction will be carried out by mobile fuel tanks equipped with pressure relief valves, built-in vents, handles for easy transportation, pumps, hoses and meters to facilitate fuel transfer operations. Any additional fuel containers and for smaller equipment (such as generators, lights etc.) used on site will be positioned on appropriately sized plant nappy/bund and stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. Taps/nozzles for fuels and storage containers for oils will be fitted with locks to ensure their use is controlled. Only designated trained and competent operatives will be authorised to refuel plant on site.</p> <p>All tank and drum storage areas shall , as a minimum, be banded, either locally or remotely, to a volume not less than the greater of the following:</p> <ul style="list-style-type: none"> • 110% of the capacity of the largest tank or drum within the banded area; or • 25% of the aggregate volume of all other substance which could be stored within the banded area. <p>The purpose of this requirement is to ensure that any potential leaks, spills, or other releases from tanks or drums are effectively contained within the banded area, preventing any environmental contamination or harm. The banded area acts as a secondary containment system, providing an additional layer of protection against accidental releases and facilitating proper clean-up and mitigation measures.</p> <p>All plant and equipment will be in good working order, checked regularly and maintained when necessary and a maintenance log maintained.</p> <p>Fuels, lubricants and hydraulic fluids will be carefully handled to avoid spillage, properly secured and provided with appropriate type of spill containment kits in case of incident.</p> <p>All spill-kits will be inspected on a weekly basis by the EnCoW to ensure they are maintained as fit for purpose</p> <p>Welfare / hygiene facilities will be located within the construction compounds only.</p> <p>All water from vehicle wheel washes will be removed from site and disposed of in line with Waste Legislation.</p>



EIA Section	Development Phase	Mitigation Measure
		<p>Control of Concrete Runoff</p> <p>Precast concrete will be used wherever possible e.g. for the structural elements of watercourse crossings (single span / piped crossings) as well as cable joint bays. However, ready mix and lean mix concrete will be required during the construction phase e.g. for turbine foundations, as blinding works for joint bay pits, culverts and cross drains, for concrete pads for bottomless culvert and clear span bridge foundations. On-site batching will not be permitted. Concrete will instead be transported to the Proposed Development by concrete truck. Quick setting concrete mixes will be used as feasible to reduce the risk of contaminated run-off to drains and watercourses.</p> <p>The risk of concrete runoff from turbine foundation works areas will be minimal given that all turbine foundations are located a minimum of 75m from any watercourse and 15m from any drain. Additionally, the formwork and site preparation works will contain the concrete in an enclosed, excavated area. For watercourse crossings requiring concrete works, these works will be carried out under dry works conditions, as discussed further below in relation to 'Works in or Adjacent to Waters'.</p> <p>The acquisition, transport and use of concrete will be planned fully in advance of commencing works such that volumes are minimised, the route to and through the Proposed Development is predetermined so as to aim to avoid drains and watercourses and wash down areas are appropriately located. Additionally, all concrete works will be supervised at all times by the Developer's appointed Environmental / Ecological Clerk of Works.</p> <p>No surplus concrete will be stored or deposited anywhere on site. Such material will be returned to the source location or disposed of off-site at a licenced waste facility.</p> <p>Concrete trucks will not be washed out on Site. Where chutes, hoppers/skids and equipment (e.g. vibrating wands) associated with concrete works need to be washed down this will be done into a sealed mortar bin / skip with the appropriate capacity, and which has been examined in advance for any defects. The location of wash down areas will be set back as far as practically possible from any drain or watercourse, and a minimum of 50m. This requirement will be communicated to all on-site personnel and to each concrete truck driver prior to entering into the works area. Washout areas / mortar bins will be sized such that they are capable of withstanding an unexpected heavy rainfall event without overtopping and they will be covered when not in use.</p> <p>Concrete washing will be contained and managed. Waste concrete slurry, washings and supernatant will be allowed to settle/dry and will be taken to a licensed waste facility for disposal.</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>Any shuttering / formwork installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting, foams or other sealing products at joints.</p> <p>Pouring of concrete into standing water within excavations will not be undertaken. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the treatment train and buffered surface water discharge systems in place. Where the isolated working area requires constant dewatering to maintain a dry works area, pumps shall be turned off during the concrete pour, and remain off until it can be ensured that the discharge will not result in a change in pH of +/-0.5 units for any nearby watercourse or drain. Alternatively, any dewatering from these areas during the concrete pour will be taken off site for disposal at a licensed waste facility for disposal. Once concrete has cured the pH of any water required to be dewatered should be checked and none of that water allowed to enter the environment unless it is back to within the normal baseline range of the local network.</p> <p>Concrete works will be scheduled during dry weather conditions to reduce the elevated risk of runoff and will avoid foreseen sustained rainfall (any event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3mm/hour), and do not proceed during any yellow (or worse) rainfall warning issued by Met Éireann.</p> <p>It will be ensured that suitably sized covers are available for freshly poured concrete to avoid wash off in the event of rain.</p> <p>The EnCoW / ECoW will continually monitor the pH of any watercourse during concrete works in or adjacent to a watercourse or drain. Should any change in pH +/-0.5 be detected, concrete works will immediately be ceased. Steps will then be taken to identify the entry point to the drain or watercourse and appropriate measures will be implemented to prevent further escape to the environment.</p> <p>Spill kits will be readily available at the location of concrete works and will be appropriate for the containment and control of concrete spills and/or runoff.</p> <p>The Community Water Officer for the South East Region, National Parks and Wildlife Services and Inland Fisheries Ireland will be notified immediately of any concrete spills / runoff into a watercourse.</p> <p>Control of Sediment Runoff</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>The drainage, attenuation and surface water management systems proposed for the Proposed Development as set out in the SWMP and 0500-Series planning application drawings will be installed concurrent with the main construction activities in order to control increased runoff and associated suspended solids loads.</p> <p>Waters arising from dewatering during excavation works will be diverted into the surface water management system such that it is captured in settlement ponds and discharged diffusely over land. Where sediment loading from dewatering works is high, it may be necessary to first pass the flow through settlement tank(s) e.g. Silt Buster or similar. For smaller areas of dewatering it may be sufficient to dewater onto adjacent lands within the Planning Boundary via filter bags, filter mats or natural vegetation. This will be determined by the EnCoW / ECoW. Water quality in the nearby downstream drains and watercourses will be monitored in real time for turbidity. Where turbidity equals or exceeds 28 Nephelometric Turbidity Units (NTU) the works will be stopped and an investigation into cause carried out and measures taken as appropriate.</p> <p>A Peat and Spoil Management Plan has been prepared for the Proposed Development and is included in Appendix C of the CEMP.</p> <p>No permanent stockpile will remain at the Proposed Development site during the construction or operational phase of the Proposed Development. Excavated material will be either reused as fill / landscaping material within the Proposed Development site or will be stored temporarily as stockpiles (in accordance with waste legislation) adjacent to the area of excavation and subsequently removed from the Proposed Development site in accordance with waste legislation. Stockpiles will be covered with plastic sheeting.</p> <p>The Grid Connection Route will require excavation of cable trenches in existing roadways as well as within a small area of private lands where HDD works will be carried out. All spoil from trenches in public roadways will be removed from Site as it is excavated and transported to a licenced waste facility. Spoil from HDD entry and exit pits will be treated as above. Road surfacing materials will be stored in a skip for recycling.</p> <p>Earthworks will be scheduled during dry weather conditions where feasible to reduce the elevated risk of runoff and will avoid any foreseen intense rainfall event (>3mm/hour) and will not proceed during any yellow (or worse) rainfall warning issued by Met Éireann.</p>



EIA Section	Development Phase	Mitigation Measure
		<p>Silt fences will be established downslope along the perimeter of source areas of contaminated runoff. Silt fences will be installed close to source (as opposed to close to receptor). Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh or terram. The base of the silt fence will be bedded at least 15- 30 cm into the ground. Once installed the silt fence will be inspected regularly, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains and periodically thereafter. The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately. Any build-up of sediment along the fence will be removed as deemed necessary by the EnCoW and in accordance with manufacturers requirements. The silt fencing will be left in place until the works are completed (which includes removal of any temporary ground treatment). Silt fences will not be removed during heavy rainfall. The silt fence will not be pulled from the ground but cutaway at ground level and posts removed. A record of when it was installed, inspected and removed will be maintained by the EnCoW.</p> <p>Works in or Adjacent to Waters</p> <p>All works within and adjacent to watercourses will be carried out in accordance with Inland Fisheries Ireland Biosecurity Protocols: https://www.fisheriesireland.ie/Biosecurity/biosecurity.html. Appropriate facilities and measures will be put in place to ensure that aquatic pathogens and invasive species are not spread between watercourses.</p> <p>All in-stream works will be carried out under dry works conditions i.e. the works area will be isolated from the river/stream/drain flow by means of temporarily overpumping or fluming the flow. The diversion of flow by overpumping / fluming will be into the same waterbody i.e. flows will not be diverted from one watercourse to another. The flume pipe and / or the pumps will be sized appropriate to watercourse flow and will have capacity to accommodate storm flows. Fluming is the preferred option for fishery watercourses and must be such that fish passage is maintained. Where overpumping is proposed, measures (such as screening) will be taken to ensure that fish do not become entrained in the pump. Additionally, measures will be taken to reduce sedimentation caused by pumping e.g. creating of a gravel-lined sump.</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>In order to create a dry works area, an upstream barrier will be installed using aquadam or sandbags (which will be double bagged and tied). Straw bales will not be permitted. Flows will either be overpumped or flumed downstream of the works area. A downstream barrier will then be installed, and the works area dewatered. Direct dewatering into the watercourse will not be permitted as it will increase the risk of sedimentation. Instead dewatering will be via filter bag, sediment tank, filter mats or natural vegetation adjacent to the watercourse. Discharging of construction water (trade effluent) directly to surface waters is a licenced activity. No extracted or pumped or treated construction water from the isolated construction area will be discharged directly to a drain or watercourse (This is in accordance with Local Government (Water Pollution) Act, 1977 as amended).</p> <p>Any watercourses requiring a dry works area will require a fish salvage exercise which must firstly be Authorised under Section 14 of the Fisheries (Consolidation) Act 1959. Fish salvage by electrofishing will not be carried out where water temperature exceeds 20°C. Fish salvage operations can only be conducted by qualified ecologists under said licence. A detailed method statement will be provided as part of the licence application. The work will have regard to the following general guidelines for electrical fishing include Beaumont et al., (2002) “Guidelines for Electric Fishing Best Practice” and Scottish Fisheries Coordination Centre (2007) “Electrofishing team leader training manual” and Central Fisheries Board (2008) Methods for the Water Framework Directive Electric Fishing in wadable reaches”.</p> <p>No in-stream works will be carried out in any WFD mapped watercourse or associated riparian during the salmonid spawning season (which is October to May inclusive).</p> <p>If it is necessary to sling concrete in a skip/hopper for the works or to pump concrete into the works area, the pump and/or hopper/skip will be moved only within or above the isolated works area and will not be allowed to operate above the watercourse .</p> <p>Provided the construction water within the isolation area is managed effectively, overpumping / fluming of the surface water features does not pose a significant risk to surface water quality downstream of the watercourse crossings.</p> <p>The EnCoW / ECoW will monitor the pH, temperature, DO, turbidity and conductivity of the watercourse upstream and downstream of the isolated works area. The works will be immediately stopped, and an investigation of cause carried out and mitigated in the event of the following:</p> <ul style="list-style-type: none"> • any change in pH +/-0.5 detected between upstream and downstream monitoring locations; • downstream turbidity exceeds 28 NTU • DO drops below 80% saturation



EIA Section	Development Phase	Mitigation Measure
		<p>Horizontal Directional Drilling</p> <p>HDD will be employed along the GCR in accordance with the following methodology:</p> <ul style="list-style-type: none"> • A specialist contractor shall be appointed to prepare Method Statements of works. • Fuels, lubricants and hydraulic fluids for equipment use on Site will be carefully handled to avoid spillage, properly secured and provided with spill containment kits in case of incident. • The depth of the bore will be at least 3m below the level of the public road and stream bed so as not to conflict with the road drainage and watercourse; • Fluid return lines used in HDD process will be tested for leaks prior to use to check their reliability; • Inert, biodegradable drilling fluid will be used; • All practices involving bentonite will be monitored closely, that is: pumping pressure, drilling mud formulation i.e., drilling fluid volume and the volume of mud returns; • A comprehensive monitoring system will be established to closely oversee any procedures involving bentonite, encompassing the careful observation of pumping pressure, the precise formulation of drilling mud (including drilling fluid volume), and the accurate measurement of mud returns.
12.12.4	Operational Phase	<p>The <i>Surface Water Management Plan</i> (included in Appendix 12.1) will ensure that there is no effect on water quality as a result of the Proposed Development. The proposed drainage system will provide several stages of treatment to surface water runoff from constructed areas, which follows the concept of a multi-stage SuDS ‘treatment train’.</p> <p>Interceptor drains installed upslope of access tracks and areas of hardstanding will divert surface water runoff from undeveloped land around the constructed areas to disperse naturally within open ground without mixing with the construction drainage.</p> <p>The proposed swales will intercept surface water runoff from access tracks and areas of hardstanding. The grass within the swales will provide some filtration to remove a portion of silt and suspended solids. Silt traps will be provided upstream of outfalls from roadside swales.</p>



EIAR Section	Development Phase	Mitigation Measure
		The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to discharge. Additional treatment will be provided upstream of the settlement pond with the use of drainage stone at the inlet to provide filtration. In an emergency, the outfall from a settlement pond will be blocked to provide a temporary holding area for accidental spillages on site.
12.12.5	Decommissioning Phase	The access tracks will remain in situ for land management purposes, after the end of the operational period. Additionally, the turbine foundations and hardstanding will remain in situ and be covered over with soil from the Proposed Development site to re-vegetate naturally. This inherently mitigates disturbance through decommissioning process. Silt protection procedures, similar to during construction will be re-instated for decommissioning. If there is perceived to be risk of erosion during inspection of the revegetated hardstanding then erosion control measures will be taken.
Chapter 13 - Shadow Flicker		
13.5	Operational Phase	<p>The Applicant will install a shadow flicker impact control system at turbines no. 1, 2 and 11 which have the potential to cause shadow flicker on nearby properties. This system will be installed prior to operation of turbines.</p> <p>A shadow flicker control system consists of a number of control modules with associated light sensors, clock and timer, and specialised software. The calculated shadow flicker periods will be input into the turbine control software and when the correct conditions are met i.e. the light intensity is sufficient, during a potential period of shadow flicker, individual turbines will cease operation until the conditions for shadow flicker are no longer present. The actual light level that would trigger a turbine shut down will be manually configured to reflect local conditions. Shadow flicker control modules will be used to ensure that a near zero level of shadow flicker is achieved, allowing for the reaction time of the shadow flicker control modules and also allowing for a short period of time for the turbine blades to slow down to a stop.</p> <p>Appendix 13-3 of Chapter 13 - Shadow Flicker, contains a list of times when each turbine could theoretically cause shadow flicker and this data will be input into the control software.</p>
Chapter 14 - Traffic & Transportation		
	Pre-Commencement Phase	A Traffic Management Plan has been completed and can be reviewed in Appendix 14.1 of Chapter 14 - Traffic & Transportation. A detailed traffic management plan (TMP) will be agreed with the road's authority and An Garda Síochána prior to commencing construction.



EIA Section	Development Phase	Mitigation Measure
	Construction Phase	<p>The Site</p> <p>This section outlines the mitigation measures that will reduce, minimise or eliminate the potential impacts created by the Proposed Development and outlined above.</p> <p>The following mitigation measures are proposed to reduce the impact of the construction activity in relation to the construction phase of the Proposed Development:</p> <p>Traffic Management Plan</p> <p>A Traffic Management Plan has been completed and can be reviewed in Appendix 14.1 of Chapter 14 - Traffic & Transportation. A detailed traffic management plan (TMP) will be agreed with the road’s authority and An Garda Síochána prior to commencing construction.</p> <p>Grid Connection Works</p> <p>Mitigation measures proposed for the grid connection works include:</p> <ul style="list-style-type: none"> • Road Opening: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening license as agreed with the local authority. • Route Proofing: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed. This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road. • Road Cleanliness: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used, when necessary, to ensure that the public road network remains clean. • Temporary Trench Reinstatement: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority. <p>Surface Overlay after Trench Reinstatement: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a full surface overlay. Details to be agreed with the roads authority At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.</p> <p>Turbine Component Delivery Mitigation</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>The turbine delivery route has been assessed using a detailed appraisal of potential routes and the identification of the most appropriate route including the accommodation requirements along the route to mitigate the impact of the turbine delivery. The impact of the deliveries on traffic is mitigated by delivering components during off-peak or night-time deliveries.</p> <p><u>Mitigation measures proposed for the turbine delivery route also include:</u></p> <ul style="list-style-type: none"> • Programme of Deliveries: a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the Proposed Development site. The programme will include details of the dates and times of each component delivery along with the route to be taken. Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company. • Garda Escort: Turbine deliveries will be escorted by An Garda Síochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised. • Reinstatement: Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition. <p>Consultation: Consultation with the local residents and Waterford City and County Council will be carried out in advance to manage turbine component deliveries.</p>
	Operational Phase	<p>Site entrances to the Proposed Development will be maintained continually to ensure visibility conditions at these entrances has not deteriorated. Hedgerow maintenance will be required periodically to ensure continued visibility at site entrances. It should be noted that no heavy vehicles such as HGV's will be required on site during the operational phase of the Proposed Development, however, abnormal deliveries may be required on occasion in the event that a blade or heavy component requires replacing.</p>
	Decommissioning Phase	<p>The traffic impact associated with the decommissioning phase will be significantly less than the construction phase. It is proposed that infrastructure associated with the grid connection will form part of the national transmission network and will be left in-situ. Therefore, no impacts are envisaged upon decommissioning of the wind farm project and no mitigation is required.</p> <p>Mitigation measures adopted for project decommissioning shall be in line with those identified for the construction phase of the Proposed Development.</p>



EIAR Section	Development Phase	Mitigation Measure
		All decommissioning works are to be carried out in accordance with a decommissioning plan to be agreed with the planning authority in advance of the decommissioning works. Traffic management measures identified will be included in the decommissioning plan for the wind farm, where it should be noted, that all turbines will be dismantled and removed by regular HGV size loads and that no abnormal loads will be required during this phase.
Chapter 15 - Archaeological, Architectural & Cultural Heritage		
15.6	Construction Phase	<p>A suitably qualified archaeologist will be employed to monitor construction phase ground works under licence by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage. In the event that any archaeological sites or features are identified during monitoring, ground works will halt at the location and the archaeological remains will be securely cordoned off and recorded. The NMS will then be notified and consulted to determine further appropriate mitigation measures, which may include preservation in situ by avoidance or preservation by record through a systematic, licensed archaeological excavation.</p> <p>Cordoned off buffer zones around the three undesignated cultural heritage constraints identified within the Site, which comprise a drystone agricultural structure and associated field, an upright stone and field clearance cairns will be established by the archaeologist appointed to monitor the construction phase, and these will extend at a minimum of 10m from the outer edges of these features. The buffer zones will be securely fenced off and clearly signed as 'No Entry' areas for the duration of the construction phase. No ground excavation works, machinery traffic, storage of materials or any other activity related to construction will occur within these buffer zones. The locations of these onsite constraints will also be identified as 'no-entry' areas during the construction phase site inductions.</p>
Chapter 16 - Landscape & Visual Impact		
16.6	Pre-Commencement Phase	<p>Given the highly visible nature of commercial wind energy developments it is not generally feasible to screen them from view using on-site measures as would be the primary form of mitigation for many other types of development. Instead, landscape and visual mitigation for wind farms must be incorporated into the early stage site selection and design phases.</p> <p>In this instance, the two main forms of landscape and visual mitigation employed were:</p> <ul style="list-style-type: none"> • Avoidance in design; • Buffering of Residential Receptors.



EIAR Section	Development Phase	Mitigation Measure
		<p>Mitigation by Avoidance and Design</p> <p>Macro Works have been involved in the Proposed Development since 2020, when early-stage constraints and layout analysis assessments took place. One of the main mitigation by design measures employed after the early stage constraints and layout analysis assessments was to contain the Proposed Development, insofar as possible, within the horse-shoe ridge the Proposed Development is located along and within. A set of preliminary wireframe montages were generated from some key viewpoints throughout the study area, which identified that some of the turbines in the initial layout appeared slightly disjointed from the main turbine array and presented slightly out of context as they were located further uphill along the eastern extents of the Proposed Development. Thus, when viewed from surrounding receptors, some of these turbines appeared as slight outliers and presented along the more elevated, rugged sections of the Comeragh Mountains, as opposed to the transitional foothills that the remaining turbines in the proposed array are located in.</p> <p>As part of further design iterations, an additional turbine was sited to the west of the horse-shoe ridge within an area of conifer forestry along the west-facing sloping lands. Further sets of preliminary wireframe montages identified this turbine presented as an outlier to the rest of the Proposed Development. As part of further mitigation measures in line with the existing proposals to contain all proposed turbines within or along the horse-shoe ridge, this turbine was also relocated to the sloping lands within the horse-shoe ridge and landscape context of the remaining proposed turbines.</p> <p>Furthermore, an assessment of various layouts was undertaken ranging from 10-14 turbines at tip heights ranging from 150-200m (refer to Appendix 16.4, Chapter 16 - Landscape & Visual Impact). It was considered that the layout of 14 turbines at a tip height 150m presented slightly disjointed in this landscape context with little sense of order and extended further in to the elevated uplands than then the 10 turbine arrays. With regard to the 10 turbine arrays, both of these were viewed in a much more compressible manner in this landscape context and presented as being contained within and along the horseshoe ridge. Nonetheless, it was considered that the 200m tip height turbines had more potential to generate a sense of overbearing for local receptors in this context than the 185m tip height turbines. As a result, a final layout comprising 10 turbines located within or along the horseshoe ridge at a tip height of 185m was then generated from this iterative design process.</p> <p>Buffering of Residential Receptors</p>



EIAR Section	Development Phase	Mitigation Measure
		<p>For the Proposed Development, the minimum distance of any turbine from the nearest residential receptor is 820m, which is in excess of the draft Wind Energy Development Guidelines (2019) minimum set back of 500m and the setback distance of 4 times the tip height of the proposed turbines. In this instance the setback for visual amenity purposes would be 740m from residential receptors on the basis of the 185m high turbines.</p> <p>Variation in residential buffer distances within the nearest kilometre has a much more noticeable effect on perceived turbine scale than when it occurs in the context of more distant views. This is due to the law of perspective – that doubling the distance to an object halves its perceived height. The reduction factor is even more pronounced when considered in the context of the ‘swept area’ of turbine blades and not just their tip height.</p>
Chapter 17 - Material Assets, Telecommunications and Aviation		
17.6	Construction and Operational Phase	<p>T Existing services along the proposed GCR have been predicted through a desktop study and will be confirmed in the pre-construction surveys prior to construction. This will minimise the impact in terms of disruption or damage to existing utilities. Where possible, the cable will be laid above or below existing services as opposed to having to divert the existing services. Communication with service providers will be maintained for the duration of the construction works as necessary.</p> <p>Where services are required to be interrupted to accommodate turbine delivery or construction of the GCR, residents and business in proximity to the works will be informed in advance. Additionally the service providers will notify the public of any such interruptions or changes in water pressure, as is current practice (e.g. https://www.water.ie/help/supply/no-water-or-low-pressure/?map=supply-and-service-updates and https://www.esbnetworks.ie/power-outages).</p>



17.2 EIAR Monitoring Measures

Table 2: Schedule of Monitoring Measures

Section	Development Phase	Monitoring Measure
Chapter 6 - Population and Human Health		
6.8.5.2	Fire	A nominated competent person will carry out checks and routine maintenance work to ensure the reliability and safe operation of fire-fighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on site at all times.
Chapter 9 - Biodiversity		
8.10.3.3	Mammals	A preconstruction mammal survey will be undertaken to reconfirm the findings of the EIAR.
	Bats	<p>Post Construction surveys</p> <p>Monitoring will take place for at least 3 years from operation commencing, providing sufficient data to detect any significant change in bat activity relative to pre-construction levels. It will assess changes in bat activity patterns and the efficacy of mitigation to inform any changes to curtailment.</p> <p>During years one to three of operation (under blanket curtailment restrictions) bat activity will be measured continuously between April and mid-October at each turbine location, in combination with carcass surveys. In addition, wind speed and temperature data will be continuously recorded at the nacelle height of each turbine.</p> <p>Modern remotely-operated wind turbines as proposed here allow cut-in speeds to be controlled centrally/automatically, facilitating an operation regime designed to minimise harmful impacts to bats.</p>



Section	Development Phase	Monitoring Measure
		<p>The feathering of turbine blades combined with increased cut-in speeds have been shown to reduce bat fatalities from 30% to 90% (Adams et al., 2021, Arnett et al., 2008, 2011, 2013; Baerwald et al., 2009). The most recent of studies showed a 63% decrease in fatalities (Adams et al., 2021).</p> <p>Monitoring Curtailment</p> <p>If, following the initial 3 years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring (refer below), increased cut-in speeds will continue. This will subsequently be monitored in years 5, 7, 10, 15, 20, 25 and 30 with further review after each monitoring period.</p> <p>Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations is reduced (to low) then consent will be sought from Cork County Council (in consultation with NPWS) for the cessation in the requirement for these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures.</p> <p>Where post construction acoustic surveys are undertaken, they will utilise full spectrum automatic detectors deployed, as a minimum, for one complete bat activity season.</p> <p>Acoustic monitoring will be supplemented with thermal imaging cameras etc. to provide more detailed information on bat activity in the vicinity of turbines. Due to the level of Leisler’s activity within the study area, nacelle-level surveys¹ are also proposed for the post construction surveys. These will be used to identify the level of Leisler’s bat activity above the tree canopy and within the height of the rotor-swept area.</p> <p>An assessment of static data gathered during operational surveillance will be completed using the online analysis tool Ecobat as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.</p>

¹ Used to supplement ground-based equipment designed to replicate the survey effort undertaken at the pre-application stage (see Roemer et al., 2017). They are particularly useful at woodland key-holed Sites.



		<p>Lighting</p> <p>It appears that the lighting on top of wind turbines may affect the likelihood of bats colliding with turbines. Research on this topic, which is reviewed in Powelsland (2009), indicates that intermittent lighting is less likely to cause species to collide with turbines.</p> <p>As such, flashing red aviation obstruction lights will be provided on perimeter turbines, subject to approval by the IAA. These will not negatively impact bats (Bennett and Hale 2014).</p> <p>Buffer zones</p> <p>The tree-free buffer zones around the turbines will be managed and maintained during the operational life of the development. These will be kept clear by mechanical means only (no chemicals / herbicides) and maintained on an annual basis in the same condition as during first clearance.</p> <p>Due to mitigation by design, all other turbines are proposed to be Sited at a suitable separation distance from trees and trees or shrubs which establish are to be removed to ensure a woodland-free buffer zone.</p> <p>The immediate surroundings of individual turbines will be managed and maintained so that they do not attract insects (i.e. the concentration of insects in the wind turbine vicinity should be reduced as much as possible, but not such that insect abundancies affected elsewhere on the Site). This will be achieved through physical management of habitats without the use of toxic substances.</p> <p>The radii of the buffer zone is determined by the height of surrounding vegetation. It is noted that there are no trees around any of the turbines and as such felling is not required at any of the turbine locations. However, a precautionary buffers of 101m surrounding the turbines for vegetation management have been applied. These will apply in the case that regular grazing of this area ceases, and targeted intervention is required to keep vegetation short.</p> <p>Monitoring of mitigation measures</p> <p>The success of the implemented mitigation measures for bats on the project will be monitored for a period of no less than three years post construction and appropriate measures taken to enhance these if and where required.</p>
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Bat fatality monitoring

Whilst no significant residual impacts on bats are predicted, the proposed development could provide an opportunity to gain baseline data on bat/turbine interaction and the scheme will be monitored for bat fatalities for the first three years of operation (post construction surveys) and subsequently in years 5, 7, 10, 15, 20, 25 and 30 as part of the additional curtailment monitoring schedule. A comprehensive onsite avian fatality monitoring programme will be undertaken following published best practice. This fatality monitoring programme will be extended and duplicated for bat fauna.

The primary components of the bird mortality programme are outlined below, and an assessment of bat mortality will essentially follow the same methodology:

- a) Carcass removal trials to establish levels of predator removal of possible fatalities. This will be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials will be used for subsequent fatality monitoring.
- b) Turbine searches for fatalities will be undertaken following best practice in terms of search area (focusing on the hard standing) (SNH, 2019; 2021) while also encompassing the wider search radius defined by bird fatality monitoring requirements, and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.
- c) A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).
- d) Recorded fatalities will be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

Monitoring schedule proposed for bat mitigation measures

Mitigation	Monitoring	Description	Duration



Section	Development Phase	Monitoring Measure			
		Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation conducted during years 1, 2, 3, 5, 7, 10, 15, 20, 25 and 30 post construction.
Chapter 10 - Ornithology					
9.6.3	Post Construction	<p>A post construction monitoring programme will be implemented at Coumnagappul in order to confirm the efficacy of the mitigation measures; the results of this will be submitted annually to the competent authority and NPWS. Published guidance on assessing the impacts of wind farms on birds from English Nature and the Royal Society for the protection of birds recommends the implementation of an agreed post development monitoring programme as a best practice mitigation measure (Drewitt and Langston, 2006).</p> <p>In addition, published recommendations on swans and wind farms (Rees, 2012) suggests that systematic post construction monitoring; adapted to quantify collision, barrier, and displacement, be conducted over a period of sufficient duration to allow for annual variation or in combination effects. The following individual components will be carried out:</p> <p>Fatality Monitoring (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction)- A comprehensive fatality monitoring programme will be undertaken following published best practice (Shawn et al., 2010; Fijn et al., 2012 and Grunkorn, 2011); the primary components are as follows:</p>			



Section	Development Phase	Monitoring Measure
		<p>e) Initial carcass removal trials to establish levels of predator removal of possible fatalities. This will be done following best recommended practice and with due cognisance to published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results (Shawn et al., 2010). No turbines which are used for carcass removal trials will be used for subsequent fatality monitoring. Carcass removal trials will be continued for the duration of fatality searches.</p> <p>f) Turbine searches for fatalities will be undertaken following best practice (Fijn et al., 2012 and Grunkorn, 2011) in terms of search area (minimum radius hub height of 81m) and at intervals selected to effectively sample fatality rates based on carcass removal rates (1 per month). To be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring to be agreed with NPWS.</p> <p>g) A standardised approach with a possible control group and/or variation in search techniques such as straight line transects/ randomly selected spiral transects/ dog searches will be undertaken. This will provide a means of robustly estimating the post construction collision fatality impact (if any).</p> <p>h) Recorded fatalities will be calibrated against known predator removal rates to provide an estimate of overall fatality rates.</p> <p>Reports will be submitted to the competent authority and NPWS following each round of surveys.</p> <p>Flight Activity Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction) - A flight activity survey will be undertaken during the summer and winter months to include both vantage point and hinterland surveys as Per SNH (2017) guidance:</p> <p>a) Record any barrier effect i.e. the degree of avoidance exhibited by species approaching or within the Site (Drewitt and Langston, 2006). Target species to be all raptors and owls, all wild goose and duck species, all swan species, and all wader species.</p> <p>b) Record changes in flight heights of key receptors post construction.</p>



Section	Development Phase	Monitoring Measure
		<p>Reports will be submitted to the competent authority and NPWS following each round of surveys. This survey is to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.</p> <p>Monthly Wildfowl Census (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A monthly wildfowl census, following the methods utilised for the baseline survey, is to be repeated on a monthly basis during the winter period. This aims to:</p> <ul style="list-style-type: none"> c) Assess displacement levels (if any) of wildfowl such as swans post construction d) Assess overall habitat usage changes within the vicinity of the Proposed Development post construction. <p>This survey will be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS. Reports will be submitted to the competent authority and NPWS following each round of surveys.</p> <p>Breeding Bird Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey (moorland breeding bird and Common Bird Census), following methods used in the baseline survey to be repeated yearly between early April to early July. This aims to:</p> <ul style="list-style-type: none"> a) Assess any displacement effects such as those recorded on breeding birds. Overall density of breeding birds to be annually recorded. <p>Breeding Wader Survey (to be conducted during years 1, 2, 3, 5, 10 and 15 post construction). A breeding bird survey, following methods used in the baseline survey to be repeated yearly April-May-June.</p> <p>Both of the above surveys are to be conducted during years 1, 2, 3, 5, 10 and 15 post construction to allow for annual variation and cumulative effects. Dependant on results further monitoring requirements will be agreed with NPWS.</p>
Chapter 12 - Hydrology and Water Quality & FRA		



Section	Development Phase	Monitoring Measure
12.12.2	Monitoring	<p>An Environmental / Ecological Clerk of Works (EnCoW / ECoW) will be appointed by the Developer with responsibility for monitoring at the Site during the construction phase of the Development. The Clerk of Works will have the authority to temporarily stop works to prevent negative effects on hydrology or to ensure corrective action is taken to mitigate adverse effects.</p> <p>A Surface Water Quality Monitoring Programme will be established which will commence 12 months prior to construction in order to establish baseline physio-chemical conditions and hydromorphological conditions of the watercourses within the Site and will continue throughout construction and for three months post-commissioning phase of the Proposed Development.</p> <p>Monthly water quality grab samples will be taken from the Skeheens Stream (COLLIGAN_010), Knockavanniamountain Stream (COLLIGAN_010) and Colligan River (COLLIGAN_010) at locations approximately 10m downstream of the proposed watercourse crossings. Water quality sampling will be undertaken in accordance with <i>BS EN ISO 5667 - Water Quality Sampling</i>. The samples will be checked in situ for:</p> <ol style="list-style-type: none"> I. pH; II. Temperature; III. Turbidity; IV. Conductivity; and V. Dissolved Oxygen. <p>using a fully calibrated portable pH/temperature/conductivity meter (with pH resolution of 0.01 pH), turbidity probe and a flow impellor.</p> <p>The samples will then be submitted to an appropriately certified laboratory (ILAB or similar) in accordance with the laboratory custody protocol for assessment of the following parameters:</p> <ol style="list-style-type: none"> i. Biological Oxygen Demand; ii. Chemical Oxygen Demand; iii. Total Hardness; iv. Total Suspended Solids;



Section	Development Phase	Monitoring Measure
		<ul style="list-style-type: none"> v. Total Dissolved Solids; vi. Nitrate; vii. Nitrite; viii. Ammoniacal Nitrogen; ix. Molybdate Reactive Phosphorus; x. Total Coliforms; and xi. Faecal Coliforms (E.coli). <p>A record of monthly meteorological conditions (as a minimum precipitation and temperature) will be maintained.</p> <p>Biological water quality assessment using the EPA Q-value methodology will be carried out once prior to the commencement of construction and on a six month basis during the monitoring period.</p> <p>The hydromorphological baseline at the proposed watercourse crossings within the Site will be established using the River Hydromorphology Assessment Technique (RHAT)². Annual RHAT assessments will be carried out which will be compares against the baseline. The Design and Construction of the bridge crossing and culverts will minimise upstream afflux, avoid turbulence and minimise loss of the natural channel bed due to the culvert or structure in order to ensure that hydromorphology is not affected. The Design will ensure that the baseline river Hydromorphological Condition Score derived from the initial RHAT assessment is not altered such that it would impact the derived WFD hydromorphology classification.</p> <p>The Contractor will ensure that the daily visual monitoring of the surface water network for visible signs of construction impact is carried out on a daily basis for example, riparian vegetation loss, evidence of oil/fuel slick, sediment plumes, fish kill.</p>

² <https://www.riverhabitatsurvey.org/RHSfiles/RHSToolboxHelp/RiverHabitatSurveyToolbox.html?RHAT.html>



Section	Development Phase	Monitoring Measure
		<p>During the construction and commissioning phase, water quality monitoring results will be recorded and compared against baseline data and where there is a deviation beyond the 95%ile, the Contractor will investigate and as necessary sample further upstream and determine if elevated concentrations are coming from the Site, in which case the Contractor will ensure that emergency control measures are put in place to return the levels to the baseline. Similarly, the Contractor will compare results of water quality monitoring with the 95%ile <u>High Status</u> Environmental Quality Standards arising from the European Union Environmental Objectives (Surface Waters) Regulations 2009 as amended. Any deviation beyond these standards will be investigated and the findings will be report to the Community Water Officer, South East Region.</p> <p>During the construction and commissioning phase, daily inspection of environmental protection measures e.g. silt traps, check dams, ponds and outfalls and drainage channels will be carried out and any improvement works carried out within a timely manner.</p>
Chapter 15 - Archaeological, Architectural & Cultural Heritage		
15.6	Monitoring of mitigation measures	<p>There are a number of obligatory processes to be undertaken as part of archaeological licence applications which will allow for monitoring of the successful implementation of the archaeological mitigation measures. These include the submission of method statements detailing the proposed strategy for all site investigations for the approval of the National Monuments Service as part of the licence application. These documents will clearly outline the proposed extent of works and outline the onsite and consultation processes to be enacted in the event that any unrecorded archaeological sites or features are identified. A report will be compiled on all site investigations to comply with the licensing process which will clearly present the results in written, drawn and photographic formats and copies will be submitted to the National Monuments Service, the Planning Authority and the National Museum of Ireland.</p>



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