



Schedule of Mitigation Measures

Coolglass Wind Farm

Coolglass Wind Farm Limited

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Basis of Report

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1.0 Population and Human Health

1.1 Population, Population Density, Household Statistics and Age Structure

1.1.1 Wind Farm and TDR

As there will be no significant impact on population trends, density, household size or age structure, no mitigation measures are required.

1.1.2 Cable route and Recreational Amenity Trail

As there will be no significant impact on population trends, density, household size or age structure, no mitigation measures are required for the cable route and recreational amenity trail.

1.1.3 CEMP

Safety and Health

The construction works would be undertaken in accordance with primary safety and health legislation, namely:

- Safety, Health and Welfare at Work Act 2005;
- Health and Welfare at Work (General Application) Regulations 2007; and
- Safety, Health and Welfare at Work (Construction) Regulations 2013.

The construction works for the proposed development would fall under the Safety, Health & Welfare at Work (Construction) Regulations 2013. It is a key appointment in the construction process. As such, the Project Supervisor Construction Stage (PSCS) would provide a Construction Phase (Safety & Health) Plan in accordance with the regulations. This plan would include (but not be limited to) a construction programme, emergency procedures, site layouts and fire plans, method statements and details of the proposed induction programme. This induction programme would include both the PSCS's site specific rules as well as the Client's requirements and would include instructions to all staff regarding the Emergency Pollution Prevention Plan (EPPP) and relevant procedures.

An induction would be required for all workers (permanent / temporary / contractor / subcontractor), site visitors, applicant representatives or other 3rd parties. Inductions would be documented.

Plant operators and construction staff would be trained by the PSCS with regard to spill prevention/mitigation measures and procedures and in the use of relevant mitigation material (e.g. spill kits).

Staff and subcontractors employed by the PSCS would be trained and have to prove certification for any plant, vehicle or use of specialist equipment such as electrical and hot works.

Construction Management Team

The applicant would appoint a Construction Management Team, led by a Construction Site Manager. The team would include, as a minimum, a Resident Engineer.

Prior to appointment of a PSCS, the applicant would own the CEMP and the document would become uncontrolled copies when printed.

It would be the team's responsibility to ensure that the PSCS adheres to and complies with the principles of the CEMP and their Method Statements. This would likely be the responsibility of the

Resident Engineer, the ECoW and the applicant Construction Manager. The team would also be responsible for:

- Regular liaison with the PSCS's Site Manager;
- Maintaining environmental risk registers;
- Communicating with regulators and consultees such as the EPA and the local planning authority regarding any changes that need to be made to the CEMP including the Schedule of Mitigation; and
- Ensuring that any required changes are approved and updated within the CEMP.

The applicant Construction Manager and Resident Engineer would have the power to stop works at any stage should it be deemed necessary, i.e. if there were risks posed to environmental receptors from construction that could not be mitigated immediately.

Ecological Clerk of Works (ECoW)

An Ecological Clerk of Works (ECoW), would be appointed during the period of construction and post-construction restoration. The appointment of the ECoW would be approved by Laois County Council (LCC).

The purpose of the ECoW would be to provide environmental advice and monitor compliance, not implement measures. The ECoW would have a number of different tasks to carry out during construction and prior to the outset of each construction phase. They would be required to keep an active register of all issues that arise during the works and report as required to LCC, Coillte and the EPA.

The ECoW would have sufficient powers to:

- Oversee construction work and identify where mitigation measures are required;
- Authorise temporary stoppage of works if required; and
- To review working methods and advise whether alternative or more appropriate working methods require to be adopted.

The ECoW would undertake the following activities:

- To work with the PSCS to induct all site personnel with regards to key environmental sensitivities and mitigation measures to be applied during construction. Toolbox talks shall be given by the ecow throughout the construction period in the event that additional unforeseen issues arise that require alternative working methods
- Undertaking site walkovers, ensuring implementation of the water management plan with reference to water quality protection and appropriate locations for fuel and oil stores;
- Liaising with contractors during the construction phase;
- Inspecting working areas and ensuring compliance with the CEMP;
- Undertaking water quality monitoring;
- Providing advice on sediment and drainage management;
- Communicating with all site personnel regarding any environmental issues and mitigation measures;

- Oversee the need for all necessary licenses regarding protected species are obtained, if required and facilitating with the support of suitably qualified and experienced Ecologists; and
- Documenting and reporting any environmental issues and incidents as required to the applicant, LCC, Coillte and the EPA.

PSCS

The PSCS would be required to comply with and regularly review the CEMP throughout the construction period. This would include being aware of any changes or updates to the CEMP following the identification or any new environmental sensitivity or any proposed development changes. These changes would be controlled and implemented by the applicant Construction Management Team, as required.

The PSCS and their team (including any sub-contractors) would be responsible for:

- Undertaking their duties in accordance with SHWWR 2013;
- Liaising with the applicant's Construction Management Team;
- Completing the construction of the proposed development in a manner which complies with all relevant laws, rules and regulations;
- Acquiring licenses and permits as necessary for their works;
- Ensuring that all method statements in line with the principals set out in the CEMP have been provided;
- Planning, managing, monitoring and coordinating all pertinent activities relating to construction;
- Liaising with and providing justification to the regulators and consultees such as the EPA and LCC if any significant changes are required from the Schedule of Mitigation;
- Developing and implementing an Environmental Incident Response Plan and ensuring that all personnel (including sub-consultants and sub-contractors) understand and are aware of procedures to be undertaken should an environmental incident occur. This would sit as an additional appendix in the final CEMP;
- Ensuring that all personnel receive training and are aware of the potential to damage to sensitive environmental receptors and procedures required to be implemented to avoid, minimise and mitigate against such damage;
- Verifying the competence and resources of all personnel working on the proposed development and any sub-consultants and sub-contractors that were engaged on the proposed development; and
- Implementing the Mitigation Appendix.

1.2 Population, Population Density, Household Statistics and Age Structure

No mitigation measures required.

1.3 Socioeconomics, Employment and Economic Activity

Given that the potential impacts of the proposed development at construction, operation and decommissioning phases are predominantly positive in respect of socio-economics, employment and economic activity, no other mitigation measures are considered necessary for the wind farm, turbine delivery route, cable route or recreational amenity trail.

1.4 Land-use, Settlement Patterns Baseline Population and Demographic Trends

1.4.1 Wind Farm and TDR

The proposed development will alter the land use of undeveloped land where proposed works will take place. Mitigation measures for land use are primarily related to preliminary design stage, which has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur. The construction footprint has been kept to the minimum necessary to avoid effects on existing land uses in so far as possible.

Existing forestry, agricultural and hiking tracks have been incorporated into the design in order to minimise the construction of new tracks and roads and minimise the removal of forested areas. Where new access tracks are required, these have been sensitively designed in order to minimise impact on forestry and agricultural lands. Replant lands have been identified and are subject to technical approval and a separate consenting regime.

The construction and decommissioning works will be planned and controlled by the CEMP, which will provide details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which may impact on their properties or agricultural practices. This will be communicated to members of the public through a community liaison officer.

Prior to the cable route installation works within public roads, it is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions, to maintain local access as much as possible and avoid impacts on various land uses. 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.

As it is proposed to fell approximately 54.36 ha of coniferous forestry for the proposed development, replant lands of the same area are required. This will mitigate against loss of forestry land use.

1.4.2 Cable Routes and Recreation Amenity Trail

Electricity cables will be installed underground to avoid impact on agricultural and forestry practices. The cable routes, as assessed in this EIAR, is to be installed along forestry tracks and the public road. Once the cable is laid, the sections of forestry track and public road will be reinstated.

As there will be no significant impact on land-use, settlement patterns baseline population and demographic trends, no mitigation measures are required.

1.5 Recreation, Amenity and Tourism

1.5.1 Wind Farm and TDR

Mitigation measures for recreation, amenity and tourism are primarily related to the preliminary design stage of the Coolglass Wind Farm, which has allowed for the prevention of unnecessary or

inappropriate development to occur that would significantly affect any recreational or tourist amenity. In designing the Coolglass Wind Farm, careful consideration was given to the potential impact the proposed turbines may have on the of value landscape located at Timahoe round tower. As such, the design removed major views of the development from the landscape, which includes designated walking trails and tourism and heritage sites, in order to protect its high value amenity. The magnitude of visual impact on the Timahoe round rower is considered to be low, as set out in Chapter 7.

The area's potential for tourism and amenity was identified as trail walking and hiking. The development of the proposed Coolglass Wind Farm has the potential to increase the amenity value of the area by making the area more accessible to recreational users than at present, providing both new and improved tracks in and around the site which can be used for walking, and hiking and educational uses. This provision is in keeping with the character of recreational activities popular in the area.

In providing for public safety, appropriate signage and safety measures will be put in place where forestry tracks will be closed to the public due to construction and decommissioning activities of the proposed wind farm.

Once construction activities are completed, no further mitigation measures will be required.

1.5.2 Cable route and Recreational Amenity Trail

Given that the potential impacts of the proposed development at construction, operation and decommissioning phases are predominantly positive in respect of Recreation, Amenity and Tourism, no other mitigation measures are considered necessary.

In relation to the recreational amenity trail, it is noted that the proposed trail will encompass largely existing trails within the northern cluster of the proposed wind farm. Appropriate signage and safety measures will be put in place where forestry tracks will be closed to the public due to construction and decommissioning activities of the proposed recreational amenity trail.

For sensitive receptors which utilise the existing trails in the northern cluster, temporary diversions to other trails will be communicated during the duration of construction and decommissioning works in the interest of public safety.

Once the wind farm is decommissioned, the recreational amenity trail will remain in situ.

No mitigation measures are envisaged during the operational period of the proposed wind farm.

1.6 Human Health

1.6.1 Health and Safety Mitigation Measures – Construction & Decommissioning

To maintain safety and avoid health impacts on construction workers and the general public, best practice site safety and environmental management will be maintained. The proposed development will be designed, constructed, operated and decommissioned in accordance with the following:

- Safety, Health & Welfare at Work (Construction) Regulations 2013
- Safety, Health & Welfare at Work Act 2005
- Safety, Health & Welfare at Work (General Applications) Regulations 2007

Mitigation measures include:

- All construction staff will be adequately trained in health and safety and will be informed and aware of potential hazards. Furthermore, the CEMP will be circulated to all construction

workers which will detail safety protocol and methodology. The site investigation has been completed and mitigation has been proposed as detailed in section 5: Lands, Soils and Geology and Chapter 9: Water.

- A site-specific Safety and Health Management Plan has been prepared for the project in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 and is included in the CEMP. The Safety and Health Management Plan shall be finalised in accordance with this outline plan following the appointment of the contractor for the main construction works. Similarly, a site-specific Safety and Health Management Plan will be prepared for the decommissioning works.
- All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project.
- Safe Pass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required.
- The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety & Health Management Plan.
- Up to date HSE guidance will be consulted regularly in line with HSA recommendations and all reasonable on-site precautions will be taken to reduce the spread of COVID-19 on construction sites if COVID-19 remains a significant health issue during the construction phase.
- Once mitigation measures and health and safety measures are followed, the potential for impact on human health on the construction site during construction and decommissioning is expected to be non-significant and temporary.
- Public safety will be addressed by restricting access to the public in the vicinity of the site works during the construction stage. Appropriate warning signs will be posted at the construction site, directing all visitors to the site manager. Appropriate signage will be provided on public roads approaching site entrances and along haul routes. Extra safety measures will be employed when large loads are being transported, for instance, Garda escort will be requested for turbine delivery and a comprehensive turbine delivery plan will be utilised to avoid potential impact to human safety for road users and pedestrians.
- For the installation of the cable route cable in the public road, a detailed traffic management plan will be developed in discussion with locals who will be directly impacted by the works. and the local authority. Public consultation will be conducted along the cable route to inform residents ahead of construction works.
- Appropriate safety measures, traffic management, signage and communication with the public will be utilized to maintain safety and mitigate against potential danger. A traffic and transport assessment has been completed and is detailed in Chapter 12: Traffic and Transportation in the EIAR.
- Once mitigation measures and health and safety measures are followed, the potential for impact on human health for members of the public during construction and decommissioning of the proposed project is expected to be not significant and temporary.

1.6.2 Health and Safety Mitigation Measures - Operational

For operation and maintenance staff working at the proposed wind farm, appropriate site safety measures will be utilised during the operational phase by all permitted employees. All personnel undertaking works in or around the turbines will be fully trained and will use appropriate Personal Protective Equipment (PPE) to prevent injury.

Access to Coillte / FuturEnergy lands will remain open during the operational phase, however, access to the towers and the substation compound will be restricted to approved and appropriately trained personnel. The substation and battery storage area will be enclosed by palisade fencing and will be remotely monitored and equipped with intruder and fire alarms, in line with ESB and EirGrid standards.

Adequate clearance of structures from overhead lines will be provided. 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 ESNB.

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.

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 throw which can cause injury.

1.6.3 Human Health Mitigation Measures - Operational

Rigorous statutory and engineering safety checks imposed on the turbines during design, construction, commissioning and operation will ensure the risks posed to humans are negligible. 24-hour remote monitoring and fault notifications are included as standard in the Turbine Operations and Maintenance Contracts. 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 picked up on the remote monitoring system.

All maintenance work will only be carried out by people with the appropriate training and qualifications for the task at hand. All maintenance and operations work will be carried out in accordance with the relevant health and safety legislation with the appropriate planning and preparation.

Regular visual inspections and testing of battery system equipment shall be incorporated into the project's operation and maintenance schedule as per the battery storage manufacturers' requirements.

Fire safety measures and equipment in the battery storage facility shall be kept in effective working order. This includes all fixtures and fittings such as fire doors, fire detection and alarm systems, fire-fighting equipment, notices, and emergency lighting. Regular checks, periodic servicing and maintenance shall be carried out. Any defects will be put right as quickly as possible.

A nominated competent person shall 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 always kept on site.

Shadow flicker detection systems will be installed on all turbines to achieve zero shadow flicker on nearby receptors. This is further detailed in Section 11: Shadow Flicker.

In certain wind conditions, turbines will run at reduced modes of operation to maintain appropriate daytime and night-time noise levels so as not to impact on residential amenity, as required. Details of these measures are set out in Section 7: Noise and Vibration.

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.

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.

- Exact location
- Type of incident
- Hazards
- Access and egress
- Number of casualties (if any) and condition
- Emergency services present and required

The design of the proposed wind farm has considered the susceptibility to natural disasters. The proposed site drainage will mitigate against any potential flooding with the use of swales as described in Section 6 – Hydrology and Water Quality.

1.7 Renewable, non-renewable resources and utility infrastructure

Townland, distance to nearest towns and villages, surrounding and nearby land uses, sensitive receptors, local road infrastructure.

1.7.1 Wind Farm and TDR

Existing services along the proposed development will be identified 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. It is not intended to divert existing services but instead, where possible, the cable will be laid above or below existing services. Communication with service providers will be maintained for the duration of the construction works where required.

Non-renewable resources of stone and fill will be sourced locally and will be excavated from on-site borrow pits insofar as possible to minimise transportation distances, reducing CO₂ emissions. The 54.4 hectares of forestry which will be felled at the Coolglass Wind Farm site will be replanted at alternative lands under a felling licence.

To manage potential impact to roads infrastructure, a Turbine Delivery Report has been prepared and is included in Appendix 12.1 of the EIAR.

1.7.2 Cable route and Recreational Amenity Trail

Given that the potential impacts of the proposed development at construction, operation and decommissioning phases are predominantly positive in respect of renewable, non-renewable resources and utility infrastructure no other mitigation measures are considered necessary.

2.0 Air and Climate

2.1 Air Quality

2.1.1 Windfarm and TDR

2.1.2 Construction Phase

The CEMP includes for the following mitigation measures during the construction phase of the proposed wind farm relevant to air quality:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;
- A water bowser will be available to spray work areas (wind turbine area and cable route 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;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel will be used at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;
- Wheel washing facilities will be provided at the entrance/exit point of the proposed wind farm site;
- The developer in association with the contractor will be required to implement a dust control plan as part of the CEMP. In the event the Planning Authority decides to grant permission for the proposed wind farm, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority.
- Receptors which receive dusting and soiling from local routes entering the site; and dwellings directly adjacent to the cable route route 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 have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- 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.

2.1.3 Operational Phase

As the operation of the proposed wind farm will have positive impacts on air quality, mitigation measures are considered unnecessary.

2.1.4 Decommissioning Phase

Mitigation measures for the removal of wind turbines from the proposed development site would be similar as per the construction phase with respect to dust control and minimisation. The proposed access tracks across the proposed wind farm site will be left in situ and utilised as forest roads following decommissioning and no mitigation measures are proposed. In terms of the underground cable route, this will be left in situ and so no mitigation measures are proposed.

2.1.5 Cable route

During the decommissioning phase, the proposed cable route infrastructure including substations and ancillary electrical equipment will form part of the national grid and shall be left in situ. No mitigation measures are necessary.

2.2 Climate

2.2.1 General Mitigation Measures

Mitigation is designed to increase the resilience of the development, or wider environmental receptors, to climate change and focuses on increasing capacity to absorb climate related shocks.

In the context of climate change, measures to increase the adaptive capacity of the proposed development and disaster risk reduction strategies can be developed with a view to reducing vulnerability and increasing its resilience. Significant incidents related to the climate change that affect operation of the proposed development should be recorded for future analysis.

To minimize this severe weather risk at wind farms, organizations can implement new lightning safety procedures that rely on early warning systems based on total lightning detection. Total lightning is the combination of all cloud-to-ground lightning strikes and in-cloud lightning strikes. It's a best practice to rely on total lightning because nearly 80% of all lightning strikes happen in the clouds. While these aren't immediately dangerous to workers or infrastructure, they are a precursor to deadly cloud-to-ground strikes and other forms of severe weather like wind gusts, tornadoes, and hail.

When organizations use weather intelligence, you can not only see real-time wind gust information but see the forecast. Even if the gusts let up for 15 minutes, it might not be financially smart to get the turbines running again for that short of a time. An accurate wind forecast at your altitude helps decision-makers extend automatic shutoffs when more wind is in the near forecast.

Procedures undertaken prior to attending and on site during inclement weather include:

General Weather Conditions

Confirm wind speeds and forecasted weather conditions prior to site access. The Operational Controller will provide alerts if high winds are lightening are forecasted for the duration of any work or visit on site. However, it is vital that this is dynamically assessed on site by the working party of visitor. If a storm occurs, personnel should return to their vehicles, leave the wind farm without delay, and inform the Operational Controller.

If there is snow or ice forecast, note the condition of the approach roads and only proceed if safe to do so.

The approach roads may pass in proximity to wind turbines and ice may have accumulated on the blades. Do not leave your vehicle for any reason and advise the Operational Controller if your vehicle becomes immobile in proximity to a wind turbine.

Extreme Weather Conditions Procedure

- At an average wind speed of 15 m/s, no work shall be done outside the nacelle / No opening of nacelle hatch
- Work in or over hub is prohibited at 12 m/s
- Work in nacelle is prohibited at 20 m/s
- At an average wind speed of 20 m/s, all climbing of turbines is prohibited
- At an average wind speed of 25 m/s, the site shall be evacuated following the Emergency Evacuation Procedure

Snow and Ice Conditions

- If there is snow and ice forecast, before approaching a turbine. oms[ect the turbine from a safe distance.
- If ice build-up is evident on the wind turbine blades, stop the wind turbine remotely, ask yourself is it safe to go to the turbine. If not, pearl a safe distance away and monitor the turbine. If ice build-up is still evident after 45 minutes, inform the Operational Controller and cancel works.
- If ice build-up has thawed or dislodged after 45 minutes proceed with caution.
- Climbing is prohibited inside towers during mild ice and snow conditions, but no work is to be carried out on the nacelle, in the hub, or on lattice met mast towers
- Do not approach turbines during icy conditions until they have been stopped or paused. There is a risk of ice throw.
- Where roads are difficult to pass due to snow/ice, all works shall cease until conditions improve.
- Where necessary, the site is to be evacuated via marked roads.

2.2.2 Windfarm and TDR

Based on a development vulnerability assessment, measures to improve the resilience of the project to extreme rainfall, flash flood, storms, and winds are required. **Table 2-1** details specific mitigation measures for the proposed development relating to climate change adaptation.

Table 2-1 Mitigation Measures Related to Climate Change Adaptation Windfarm and TDR

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
Extreme Rainfall, Flood, Flash Flood	Consider changes / flexibility in design that provide for increased run-off across paved areas and possible increases in seasonal groundwater levels.
	Design / provide adequate surface water drainage / discharge to ground. As discussed in section 9.9.3.4 of Chapter 9: the drainage design will implement SuDs.
Storms and Winds	Ensure activities / production can proceed safety during high winds and storms.

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
	Ensure the choice of equipment deployed on the project is weather efficient.
Risk Reduction Mechanism	Secure insurance for damage of assets / site incidences.

2.2.3 Cable Route

Based on a development vulnerability assessment, measures to improve the resilience of the project to extreme rainfall, flash flood, storms, and winds are required. **Table 2-2** details specific mitigation measures for the proposed development relating to climate change adaptation.

Table 2-2 Mitigation Measures Related to Climate Change Adaptation Cable Route

Main Concerns Related to:	Proposed Alternatives or Mitigation Measures
Extreme Rainfall, Flood, Flash Flood	Consider changes / flexibility in design that provide for increased run-off and possible increases in seasonal groundwater levels. As discussed in section 9.9.3.4 of Chapter 9: there will be an implementation of a wet weather protocol
Risk Reduction Mechanism	Secure insurance for damage of assets / site incidences.

2.3 Mitigation Measures from CEMP

2.3.1 Dust Mitigation

Good practice measures as listed in below would be adopted during construction to control the generation and dispersion of dust such that significant impacts on neighbouring habitats should not occur. The hierarchy for mitigation would be prevention – suppression – containment:

- The internal access roads will be constructed prior to the commencement of other major construction activities. These roads will be finished with graded aggregate;
- 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;
- All loads which could cause a dust nuisance will be covered to minimise the potential for fugitive emissions during transport;
- Gravel will be used at the site exit point to remove any dirt from tyres and tracks before travelling along public roads;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- The access and egress of construction vehicles will be controlled to designated locations, along defined routes, with all vehicles required to comply with onsite speed limits;
- Construction vehicles and machinery will be serviced and in good working order;

- Wheel washing facilities will be provided at the entrance/exit point of the proposed wind farm site;
- The developer in association with the contractor will be required to implement a dust control plan as part of the CEMP. In the event the Planning Authority decides to grant permission for the proposed wind farm, the final CEMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Planning Authority.
- Receptors which receive dusting and soiling from local routes entering the site; and dwellings directly adjacent to the grid connection route 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 have taken place;
- Ensure all vehicles switch off engines when stationary – no idling vehicles; and
- 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.

2.4 Carbon Balance

It is considered that the proposed wind farm project will have an overall positive impact in terms of carbon reduction and climate change. It will assist Ireland in meeting the new binding renewable energy target for the EU of 32% by 2030. Also, it will aid in increasing the onshore wind capacity, as per the Climate Action Plan 2023. In terms of renewable energy, an increase in electricity generated from renewable sources is to increase to 70% by 2030, with up to 8.2GW of increased onshore wind capacity. This will be achieved by:

- Phasing out fossil fuels
- Harnessing renewable energy
- Micro-generation; and
- Other measures.

As set out in the Climate Action Plan 2023, in terms of harnessing renewable energy, the volumes and frequencies of RESS will increase, so that the 70% target is met. The measures required to achieve this include finalising RESS, establishing a Community Framework to accompany RESS, begin the qualification process for the RESS 1 Auction and to finalise the design and implementation of RESS 2 and RESS 3.

As no significant impacts on climate are predicted during construction, no mitigation measures are proposed. In terms of the operational phase, the operation of the proposed wind farm project will have a positive effect on climate due to the displacement of fossil fuels.

3.0 Landscape and Visual

Outside of those landscape and visual mitigation measures that formed part of the iterative design process of this development over of the past two years, and which are embedded in the assessed project, other specific landscape and visual mitigation measures are not considered necessary / likely to be effective. Thus, the impacts assessed in Section 7.4 of Chapter 7 of the EIAR are the equivalent of residual impacts in this instance..

4.0 Land, Soils and Geology

4.1 Construction

4.1.1 Wind Farm and TDR and Cable route

- Site operations will be managed in accordance with relevant health and Safety legislation (Safety, Health & Welfare at Work Act (2005, as amended));
- Construction phase activities will take place in accordance with the Construction Environmental Management Plan (CEMP);
- Fencing will be maintained at the Site to ensure that the risk of injury to the public and livestock is minimised;
- Stockpiles will be evaluated and monitored and kept stable for safety and to minimise erosion;
- Permission will be sought from the Forestry Service to replant lands to compensate the loss of forestry land within the site area by replanting forestry at an alternative site within the State;
- In order to reduce the risk of localised erosion (and potential dust emissions) during the excavation and infilling, the area of bare or exposed soils and rock will be kept to a minimum, insofar as practicable, by progressive restoration of final and backfilled surfaces. Where required, consideration can also be given to establishing temporary vegetation cover over stockpiled soils (pending re-use) or exposed surfaces (pending further backfilling to final ground level); and
- All aspects of the proposed backfilling / construction phase works will be undertaken in accordance with relevant best practice environmental guidance published by the Environmental Protection Agency and other regulatory agencies. All activities will be undertaken in accordance with the provisions in the Waste Management Acts and Regulations.

The proposed mitigation measures to deal with potential fuel / oil spills include the following:

- Ensuring that any refuelling of mobile plant undertaken within the site is only undertaken using double skinned bowsers;
- No oils, greases, hydraulic fluids or hazardous substances (or any associated wastes) will be stored across the application site. All such materials will be stored under cover, over fuel spill trays / bunded containers within designated storage areas within the construction compounds;
- Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of storage vessels and regular maintenance and servicing of construction plant and equipment;
- The Applicant will ensure that such plant and resources as are necessary to ensure that the site will be managed and operated in accordance with best waste management practice and that activities comply fully with environmental management systems and planning consents; and

- Contingency plans / procedures will be developed to deal with potential leaks and spills. An emergency spill response kit will be held on site.

4.1.2 Wind Turbine and TDR Only

- Further site investigations (borehole drilling) will be undertaken to confirm if the features present near to turbine location T8 are shafts and adits associated with historical coal mining; and
- Should these be confirmed as historical mining features, consideration will be given to their stability and the need for piling or other suitable engineering controls beneath turbine location T8.

4.2 Operational

4.2.1 Wind Farm, TDR, Cable route and Recreational Amenity Trail

Site operations will be managed in accordance with relevant health and Safety legislation (Safety, Health & Welfare at Work Act (2005, as amended);

In order to reduce the risk of localised erosion (and potential dust emissions) during the excavation and infilling, the area of bare or exposed soils and rock will be kept to a minimum, insofar as practicable, by progressive restoration of final and backfilled surfaces. Where required, consideration can also be given to establishing temporary vegetation cover over stockpiled soils (pending re-use) or exposed surfaces (pending further backfilling to final ground level); and

All aspects of the proposed backfilling / construction phase works will be undertaken in accordance with relevant best practice environmental guidance published by the Environmental Protection Agency and other regulatory agencies. All activities will be undertaken in accordance with the provisions in the Waste Management Acts and Regulations.

The proposed mitigation measures to deal with potential fuel / oil spills include the following :

- Ensuring that any refuelling of mobile plant undertaken within the site is only undertaken using double skinned bowsers;
- No oils, greases, hydraulic fluids or hazardous substances (or any associated wastes) will be stored across the application site. All such materials will be stored under cover, over fuel spill trays / bunded containers within designated storage areas within the construction compounds;
- Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of storage vessels and regular maintenance and servicing of construction plant and equipment;
- The Applicant will ensure that such plant and resources as are necessary to ensure that the site will be managed and operated in accordance with best waste management practice and that activities comply fully with environmental management systems and planning consents; and
- Contingency plans / procedures will be developed to deal with potential leaks and spills. An emergency spill response kit will be held on site.

4.3 Decommissioning

4.3.1 Wind Farm and TDR, Recreational Amenity Trail and Cable route

- Site operations will be managed in accordance with relevant health and Safety legislation (Safety, Health & Welfare at Work Act (2005, as amended));
- Stockpiles will be evaluated and monitored and kept stable for safety and to minimise erosion; and
- Fencing will be maintained at the Site to ensure that the risk of injury to the public and livestock is minimised.
- The proposed mitigation measures to deal with potential fuel / oil spills include the following :
 - Ensuring that any refuelling of mobile plant undertaken within the site is only undertaken using double skinned bowsers;
 - No oils, greases, hydraulic fluids or hazardous substances (or any associated wastes) will be stored across the application site. All such materials will be stored under cover, over fuel spill trays / bunded containers within designated storage areas within the construction compounds;
 - Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of storage vessels and regular maintenance and servicing of construction plant and equipment;
 - The Applicant will ensure that such plant and resources as are necessary to ensure that the site will be managed and operated in accordance with best waste management practice and that activities comply fully with environmental management systems and planning consents; and
 - Contingency plans / procedures will be developed to deal with potential leaks and spills. An emergency spill response kit will be held on site.

In order to reduce the risk of localised erosion (and potential dust emissions) during the excavation and infilling, the area of bare or exposed soils and rock will be kept to a minimum, insofar as practicable, by progressive restoration of final and backfilled surfaces. Where required, consideration can also be given to establishing temporary vegetation cover over stockpiled soils (pending re-use) or exposed surfaces (pending further backfilling to final ground level); and

All aspects of the proposed backfilling / operation phase works will be undertaken in accordance with relevant best practice environmental guidance published by the Environmental Protection Agency and other regulatory agencies. All activities will be undertaken in accordance with the provisions in the Waste Management Acts and Regulations.

5.0 Water

As stated in Chapter 3, Description of the Proposed Development, the design of the proposed wind farm development has considered a range of best practice construction measures which will ensure avoidance and reduction of impacts throughout the construction, operational and decommissioning phases. Additional measures have been developed to mitigate the impacts identified in the preceding section.

5.1 Mitigation by Avoidance

The proposed development has undergone design iterations and evolution in response to the constraints identified as part of the baseline studies and field studies so as to avoid potential effects on receptors where possible.

In identifying and avoiding sensitive surface waters, the proposed development has implemented 'avoidance of impact' measures. Mitigation by avoidance is viewed as part of the 'Reasonable Alternatives' outlined in Chapter 16.

A buffer distance between watercourses and any proposed construction activities or infrastructure was applied to those watercourses within the Site, including fuel storage and construction compounds. A 50 m buffer has been applied for the wind turbine infrastructure and the grid connection route was moved away from streams discharging into the River Nore and River Barrow. No marked streams are crossed by the turbine access tracks.

5.2 Mitigation by Prevention and Reduction

A number of mitigation measures are outlined below and are considered as in-built to the design of the project. These mitigation measures are a combination of measures to comply with legislation and best practice construction methods to be implemented in order to prevent water (surface water and groundwater) pollution. Examples of these measures are the storage of potentially polluting materials in fully bunded tanks and controlling / reducing runoff from hardstand areas.

5.3 Construction

In order to mitigate potential impacts during the construction phase, best practice construction methods will be implemented in order to prevent water (surface water and groundwater) pollution. Good practice measures will be applied in relation to pollution risk, sediment management and management of surface runoff rates and volumes.

A CEMP (Appendix 3-2 of the EIAR) was developed for the project to ensure adequate protection of the water environment. All personnel working on the project will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the CEMP.

During the construction phase, all works associated with the construction of the wind farm will be undertaken in accordance with the guidance contained within CIRIA Document C741 'Environmental Good Practice on Site' (CIRIA, 2015). Any groundwater encountered will be managed and treated in accordance with CIRIA C750, 'Groundwater control: design and practice' (CIRIA, 2016).

5.3.1 Buffer to Watercourses

A buffer distance of 50m is being applied between watercourses and any proposed construction activities or infrastructure.

5.3.2 Good Practice Measures

Implementation of good practice measures as a matter of course during the construction of the Proposed Development are not considered to be mitigation measures but form an integral part of the design/construction process. Key good practice measures are stated below and the assessment incorporates these measures as part of the Proposed

Development. Any further specific mitigation which may be required to reduce the significance of a potential effect is identified in the assessment of likely effects during the construction and operation phases.

Measures to prevent the release of any pollution/sediment are as follows:

- prior to construction, section specific drainage plans would be produced. These would take into account any existing local drainage which may not be mapped and incorporate any section specific measures identified during the assessment;
- measures will be included in the final CEMP for dealing with pollution/sedimentation/flood risk incidents and will be developed prior to construction;
- the final CEMP would contain details on the location of spill kits, would identify 'hotspots' where pollution may be more likely to originate from, provide details to Site personnel on how to identify the source of any spill and state procedures to be adopted in the case of a spill event. As identified in the outline CEMP, a specialist spill response contractor would be identified to deal with any major environment incident;
- a wet weather protocol will be developed. This will detail the procedures to be adopted by all staff during periods of heavy rainfall. Toolbox talks would be given to engineering / construction / supervising personnel. Roles would be assigned, and the inspection and maintenance regimes of sediment and runoff control measures will be adopted during these periods; and
- In extreme cases, the above protocol would dictate that work onsite may have to be temporarily suspended until weather/ground conditions allow.

5.3.3 Site Drainage

During the construction phase of the proposed development, measures would be adopted, in order to prevent silt, chemicals and/or other contaminants from being washed into existing watercourses. Areas exposed due to the removal of existing structures and/or vegetation are more susceptible to erosion during heavy rainfall so areas would be reinstated as soon as possible to minimise this effect.

This would include specific guidance in relation to drainage (and control of pollution to the water environment) around the following aspects of site infrastructure:

- Access routes;
- Foundations;
- Hardstanding areas and new structures

The appropriate methodologies to cover water control and the means of drainage from all hard surfaces and structures within the site are described in the following sections.

5.3.4 Management of Sediment and Surface Waters

Good practice construction techniques would be adopted for the management of sediment and surface water run-off generated during the construction phase of the proposed development. Sustainable Drainage Systems (SuDS) would be used where applicable.

Drainage from the site would include elements of SuDS design. SuDS replicate natural drainage patterns and have a number of benefits:

- SuDS would attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream; and
- SuDS would treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into the water environment; and
- SuDS measures, such as lagoons or retention ponds, where appropriate and correctly implemented would produce suitable environments for wildlife.

In addition, a wet weather protocol would be implemented to manage activities during periods of heavy and prolonged precipitation to be approved by LCC in consultation with the EPA.

Heavy or prolonged rainfall during construction and operation may lead to sediment transport or vegetation causing blockage to infrastructure drainage channels or any temporary watercourse crossing structures. Regular monitoring and prompt maintenance of these assets will ensure that the drainage system continues to function as designed.

Good practice measures for the management of earthworks to reduce erosion and sedimentation would include the following:

- All stockpiled materials will be located out with a 50 m buffer from watercourses;
- Where possible, stockpiled material will either be seeded or appropriately covered;
- Water will be prevented as far as possible, from entering excavations such borrow pits through the use of appropriate cut-off drainage
- Where the above is not possible, water that enters a borrow pit would pass through a number of settlement lagoons and silt/sediment traps to remove silt prior to discharge into the surrounding drainage system. Detailed assessment of ground conditions will identify locations where settlement lagoons would be feasible;
- Clean and dirty water onsite will be separated, and dirty water will be filtered before entering the water environment;
- If the material is stockpiled on a slope, silt fences will be located at the toe of the slope to reduce sediment transport;
- The amount of ground exposed, and time period during which it is exposed, will be kept to a minimum and appropriate drainage would be in place to prevent surface water entering deep excavations, specifically borrow pit excavations;
- A design of drainage systems and associated measures to minimise sedimentation into natural watercourses will be developed - this may include silt traps, check dams and/ or diffuse drainage;
- Silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- Construction personnel and the principal contractor will carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

5.3.5 Foul Drainage

Effluent and waste from onsite construction personnel would be either be treated at a package sewage treatment plant or captured and stored for offsite disposal by a licensed contractor, where there is no connection to the public foul sewer. The system would be designed for approval by the EPA prior to the construction phase of the proposed development.

5.3.6 Pollution Risk

Good practice measures in relation to pollution prevention will include the following:

- Refuelling will take place at least 50m from watercourses and where possible it will not occur when there is risk that oil from a spill could directly enter the water environment, for example, periods of heavy rainfall or when standing water is present will be avoided;
- A vehicle management plan and speed limit will be strictly enforced onsite to minimise the potential for accidents to occur;
- Drip trays will be placed under stationary vehicles which could potentially leak fuel/oils;
- Areas will be designated for washout of vehicles which are a minimum distance of 50 m from a watercourse;
- Washout water will also be stored in the washout area before being treated and disposed of;
- If any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly prior to treatment;
- Water would be prevented as far as possible, from entering excavations such as borrow pits;
- Areas of battery storage will be bunded and positively drained so that the quality of runoff can be monitored and contained if required;
- Procedures will be adhered to for storage of fuels and other potentially contaminative materials to minimise the potential for accidental spillage (e.g. Stored in 110% bunded storage facilities); and
- A plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final cemp for the proposed development.

5.3.7 Fluvial Flood Risk

It is proposed to adopt Sustainable Drainage Systems (SuDS) as part of the proposed Development. SuDS techniques aim to mimic pre-development runoff conditions and balance or throttle flows to the rate of runoff that might have been experienced at Site prior to development. Good practice in relation to the management of surface water runoff rates and volumes and potential for localised fluvial flood risk would include the following:

- Drainage systems will be designed to ensure that any sediment, pollutants or foreign materials which may cause blockages are removed before water is discharged into a watercourse;
- Onsite drainage will be subject to routine checks to ensure that there is no build-up of sediment or foreign materials which may reduce the efficiency of the original drainage design causing localised flooding.
- Appropriate drainage will attenuate runoff rates and reduce runoff volumes to ensure minimal effect upon flood risk;
- Where necessary, check dams will be used within cable trenches in order to prevent trenches developing into preferential flow pathways; and
- As per good practice for pollution and sediment management, prior to construction, section specific drainage plans will be developed and construction personnel made familiar with the implementation of these.

Further information on ground conditions and drainage designs will be provided in the final CEMP.

5.3.8 Water Quality Monitoring

Water quality monitoring during the construction phase would be undertaken for the surface water catchments that serve the site, to ensure that none of the tributaries of the main channels are carrying pollutants or suspended solids. Monitoring would be carried out at a specified frequency on these catchments.

With regard to the protection of the water environment the following risks would be addressed:

- Siltation of watercourses;
- Discolouration of raw water;
- Potential pollution from construction traffic due to diesel spillage or similar;
- Alteration of raw water quality resulting from imported track construction material;
- Excavation and earthworks
- Use of large quantities of concrete;
- Site compound and associated drainage/foul drainage and diesel spill issues; and

The PSCS would compile a monitoring and maintenance plan for the drainage system and surface water runs which would as a minimum include:

- Visual monitoring/inspections

During site works including and water crossing construction works, the relevant drainage/surface water runs potentially being impacted by these works would be inspected on a daily basis by the ecow while works are ongoing in this area.

A Water Quality Monitoring Plan (WQMP) will be developed to form part of the Construction Method Statement (CMS), which would be submitted to the appropriate planning authorities and bodies such as the EPA prior to construction and development. The WQMP will be implemented to monitor surface water quality, fish populations and macroinvertebrate community prior to, during and post-construction. A robust baseline of water quality in surface watercourses / drainage channels downstream of construction

works will be established prior to construction commencing and used a benchmark of water quality for the construction phase monitoring.

The purpose of the WQMP is to:

- Ensure that the commitments put forward in the EIA Report are fulfilled with regards to identified ground and surface water receptors;
- Provide a specification for monitoring prior to, during and after construction;
- Provide a record of water quality across the site that can be compared to rainfall and site activities;
- Provide reassurance of the effectiveness of pollution prevention measures installed to protect surface watercourses throughout the construction period; and
- Provide data to identify any potential pollution incidents, and to inform a structured approach to manage and control such incidences.

The WQMP will outline details for the monitoring of surface watercourses down gradient of works areas including watercourse crossings, access tracks, turbine foundations and borrow pits and at control sites (up gradient of works areas), and will include:

- Planning level monitoring locations;
- Frequency of monitoring prior to, during and after construction;
- Parameters for field hydrochemistry testing and laboratory analysis including as a minimum ph, electrical conductivity, suspended solids, dissolved metals, nutrients and hydrocarbons;
- Sampling and analysis protocols;
- Relevant environmental quality standards (eqs);
- Responsibilities for monitoring – it is expected that the ecow will be responsible for daily monitoring of watercourses particularly around active works areas and watercourse crossings. Further monitoring on a less frequent basis (i.e. Monthly) may be done by an external party;
- Procedures to be followed in the event of an environmental incident; and
- Recording and communicating of results.

A Private Water Supply (PWS) Action Plan would be developed and would include details regarding all water monitoring and reporting, pollution incident reporting and emergency mitigation measures to address a temporary or permanent material change in either the quality or quantity of an existing private water supply. The PWS Action plan shall include as a minimum:

- The provision of an emergency hotline telephone number for householders so that they can contact the project with any concern regarding water quality or quantity;
- The contact details of householders downgradient of work areas to alert in the event of a pollution incident;
- The provision of an alternative water supply, if required, during any periods of pws disruption; and/or
- To supply affected properties with filters for particulate removal.

5.3.9 Laboratory Analysis

This monitoring would involve laboratory analysis of water samples taken at agreed locations across the site and would continue throughout the construction phase and immediately following construction. Monitoring would be used to allow a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality would be required. Detailed water quality monitoring plans would be developed during detailed design in consultation with LCC and the EPA.

The performance of the good practice measures would be kept under constant review by the water monitoring schedule, based on a comparison of data taken during the construction phase with a baseline data set, sampled prior to the construction period and through the observance of any trends in water quality change over time.

5.3.10 Emergency Response

Drainage networks provide a conduit for rapid transport of silty water and potential contamination from surface spills of fuels / oils, concrete or chemicals. A pollution emergency incident would include any discharge to the drainage network that could potentially cause environmental damage. Examples of pollution emergency incidents include:

- Fuel drips or spills during refuelling;
- Leaking plant or equipment;
- Leaks from fuel or chemical containers;
- Contaminated water or sediment / silt entering a watercourse or drainage network;
- Windblown dust and waste;
- Excess silt deposition in drainage ditches, channels, culverts following heavy rainfall events;
- Operational failures of pumps and pipelines; and
- Failures of treatment or sediment controls.

The PSCS would be required to prepare an Environmental Incident and Emergency Response Plan (as noted in Section 6.1 of the CEMP) which would provide emergency response contacts, reporting procedures, and procedures for dealing with all potential pollution incidents during the construction of the proposed development

5.3.11 Protection of Groundwater Receptors

Areas of potential GWDTE are sustained by surface water and rainfall rather than by groundwater. Measures would be required to sustain surface water flow paths to maintain these habitats.

5.4 Operational

During the operational phase of the Proposed Development, it is anticipated that routine maintenance of infrastructure and tracks would be required across the Site. This may include work such as maintaining access tracks and drainage and carrying out wind turbine maintenance.

Should any maintenance be required onsite which would involve construction type activities; mitigation measures would be adhered to along with the measures in the CEMP to avoid potential effects.

During the operation of the proposed Development, it is not anticipated that there would be any excavation or stockpiled material, reducing the potential for erosion and sedimentation effects. Should any excavation be required, this is likely to be limited and required for maintenance of tracks etc. Any excavation, handling and placement of material from borrow pits would be subject to the same safeguards that would be used during the construction phase of the project.

5.4.1 Surface Water Quality Monitoring

Baseline surface water quality has already been undertaken at the site. Surface water quality monitoring will be undertaken during the construction phase, to ensure that there are no significant impacts to water quality.

5.4.2 Groundwater Quality Monitoring

A groundwater quality monitoring borehole has been installed near the T2 turbine base. Groundwater quality monitoring at the borehole will be undertaken during the construction phase, to ensure there are no significant impacts on groundwater quality within the inner source protection area of Kyle & Orchard Spring Water Supply Scheme.

5.5 Decommissioning

The risk of a pollution incident occurring would be managed using good practice measures as detailed in the CEMP. Many of these practices are concerned with undertaking construction activities away from watercourses and identifying safe areas for stockpiling or storage of potential pollutants that could otherwise lead to the pollution of watercourses.

Potential pollution events occurring during the construction of the turbines or any hardstanding will be controlled by good practice measures and would be subject to some attenuation in the soils before reaching groundwater.

Adherence to good practice measures would ensure that any material generated is not transported into nearby watercourses.

Location specific good practice measures would be in place for sediment control for each of the track construction activities and borrow pit to control the amount of fine sediment that could potentially enter a watercourse if not managed appropriately. These measures would be dependent upon the final borrow pit designs and stone quality, but would potentially include cut-off drainage, sediment traps, sediment lagoons and flocculation stations.

In particular, drainage, some of which would be temporary, would be required around turbine working areas, the construction compound and borrow pits to manage surface flows. Excavation of turbine foundations may require temporary de-watering for the period of the foundation build. These drainage activities may lead to temporary changes in the water table surrounding these construction activities (where de-watering is required below the level of the natural water table).

Excavations associated with constructions works (e.g. cut tracks, turbine bases foundations, cable trenches, borrow pits) can result in local lowering of the water table.

Dewatering associated with construction of wind turbine foundations is commonly temporary and dewatering following construction would not be required.

5.6 Mitigation from CEMP

5.6.1 Watercourses

As part of the design mitigation, all wind turbines and associated infrastructure (with the exception of tracks) have been sited with a minimum separation of 50m from watercourses where possible.

Tracks have been routed to minimise any crossing of the watercourse, where possible. However, if track crossings are required, then these would be designed and constructed appropriately.

Chapter 10: Hydrology, Hydrogeology, Geology and Soils of the EIA Report would include details of water crossings.

All access road river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

All construction works on the site, and specifically construction works to be undertaken within and in the vicinity of the watercourse, would be completed in compliance with current legislation and best practice as detailed within this document.

The ECoW would be consulted on all watercourse crossing works. Surveys by the ECoW would be carried out immediately prior to construction of the crossing to identify areas of ecological interest and more specifically, mammal and fish activity in watercourses to ensure that adequate mitigation is built into the design.

5.6.2 Mitigation Measure - Operational

The CEMP contains information from on refuelling.

5.6.3 Mitigation Measure - Decommissioning

The risk of a pollution incident occurring would be managed using good practice measures as detailed in the CEMP. Many of these practices are concerned with undertaking construction activities away from watercourses and identifying safe areas for stockpiling or storage of potential pollutants that could otherwise lead to the pollution of watercourses.

Potential pollution events occurring during the construction of the turbines or any hardstanding will be controlled by good practice measures and would be subject to some attenuation in the soils before reaching groundwater.

Adherence to good practice measures would ensure that any material generated is not transported into nearby watercourses.

Location specific good practice measures would be in place for sediment control for each of the track construction activities and borrow pit to control the amount of fine sediment that could potentially enter a watercourse if not managed appropriately. These measures would be dependent upon the final borrow pit designs and stone quality, but would potentially include cut-off drainage, sediment traps, sediment lagoons and flocculation stations.

In particular, drainage, some of which would be temporary, would be required around turbine working areas, the construction compound and borrow pits to manage surface flows. Excavation of turbine foundations may require temporary de-watering for the period of the foundation build. These drainage activities may lead to temporary changes in the water table surrounding these construction activities (where de-watering is required below the level of the natural water table).

Excavations associated with constructions works (e.g. cut tracks, turbine bases foundations, cable trenches, borrow pits) can result in local lowering of the water table. Dewatering associated with construction of wind turbine foundations is commonly temporary and dewatering following construction would not be required.

With the above mitigation measures in place at the application site, it is projected that the following reduction in the assessed significance of impacts will result:

- Reduction of the potential impact on groundwater quality in bedrock aquifer from accidental fuel leakage/ spillage during the operational stage from “**moderate**” to “**slight**” (No. 8).

The significance of all other potential impacts during the construction and operational stage will be reduced to “**slight**” or lower to the water environment receptors.

6.0 Noise and Vibration

6.1 Construction Mitigation

The predicted noise levels from onsite construction activity from the Proposed development are predominantly below the noise limit for the threshold of significance. Some tasks, whilst at shortest distance to the nearest NSR, have the potential to exceed the limit for a period. To reduce the potential effects of construction noise, the following types of mitigation measures are proposed:

- Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle deliveries to the site would be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries would only take place outside these times with the prior consent of the Council and the Police. Those activities that are unlikely to give rise to noise audible at the site boundary will continue outside of the stated hours.
- All construction activities shall adhere to good practice as set out in BS 5228.
- All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain always fitted.
- Where flexibility exists, activities will be separated from residential neighbours by the maximum possible distances.
- A site management regime will be developed to control the movement of vehicles to and from the Development site.
- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels.

6.2 Operational Mitigation

The selection of the final turbine to be installed at the site would be made on the basis of enabling the noise limits to be achieved at the surrounding properties. The assessment demonstrates that the SG155-6.6 MW and the V162-7.2MW turbines can operate without constraint or the need for mitigation and comply with noise limits derived from the 2006 Guidelines.

Technical Appendix 10.5 of the EIAR provides an example of the operational modes necessary for the SG155-6.6 turbine to meet the noise limits derived under the 2019 Draft Guidelines..

6.3 Mitigation Measures from the CEMP

Noise Management

The sources of construction noise are temporary and vary both in location and their duration as the different elements of the site are constructed, and arise primarily through the operation of large items of plant and equipment such as bulldozers, diesel generators, vibration plates, concrete mixer trucks, rollers etc. Noise also arises due to the temporary increase in construction traffic near the site. The level of noise varies depending on the different elements of the site being constructed.

The predicted noise levels from onsite construction activity from the Proposed development are predominantly below the noise limit for the threshold of significance. Some tasks, whilst at shortest distance to the nearest NSR, have the potential to exceed the limit for a period. To reduce the potential effects of construction noise, the following types of mitigation measures are proposed:

- Those activities that may give rise to audible noise at the surrounding properties and heavy goods vehicle deliveries to the site would be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries would only take place outside these times with the prior consent of the Council and the Garda. Those activities that are unlikely to give rise to noise audible at the site boundary will continue outside of the stated hours.
- All construction activities shall adhere to good practice, guidance can be found in BS 5228.
- All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain always fitted.
- Where flexibility exists, activities will be separated from residential neighbours by the maximum possible distances.
- A site management regime will be developed to control the movement of vehicles to and from the Development site.
- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels.

7.0 Cultural Heritage

7.1 Mitigation

7.1.1 Wind Farm

Monitoring, in the form of a watching brief, is conducted on all ground-breaking works within the site due to the potential for preservation of previously unrecorded archaeology. Due to the nature of the landscape and its historical value, archaeological monitoring will prevent any loss of knowledge from the landscape. Any monitoring or further mitigation works should be undertaken by a suitably qualified and licensed archaeologist. The precise scope of the mitigation works would be negotiated with the Minister of Arts, Heritage, Gaeltacht, and the Islands and an agreed mitigation program would be documented in an agreed Written Scheme of Investigation (WSI).

7.1.2 Cable route

Regarding the Enclosure (**LA024-038**), the Minister of Arts, Heritage, Gaeltacht, and the Islands must be given two months' notice of any intended works within the Zone of Notification under Section 12(3) of the National Monuments (Amendment) Act 1994.

Regarding the impact on the town of Timahoe, due to the nature of an ACA, it is required that works to the public realm (including roads) will be required to respect the special character of the area also. As such, any damage to the road within the Timahoe resulting from ground-breaking works must be fixed/replaced as it was or in the same style as the road pre ground-breaking.

Ground-breaking works should be monitored, in the form of a watching brief. Any monitoring or further mitigation works should be undertaken by a suitably qualified and licensed archaeologist. The precise scope of the mitigation works would be negotiated with the Minister of Arts, Heritage, Gaeltacht, and the Islands and an agreed mitigation program would be documented in an agreed Written Scheme of Investigation (WSI).

7.1.3 Mitigation Measures from the CEMP

Monitoring, in the form of a watching brief should be conducted on all ground-breaking works within the site due to the potential for preservation of previously unrecorded archaeology. Due to the nature of the landscape and its historical value, archaeological monitoring will prevent any loss of knowledge from the landscape. Any monitoring or further mitigation works should be undertaken by a suitably qualified and licensed archaeologist. The precise scope of the mitigation works would be negotiated with the Minister of Arts, Heritage, Gaeltacht, and the Islands and an agreed mitigation program would be documented in an agreed Written Scheme of Investigation (WSI).

8.0 Traffic and Transportation

8.1 Wind Farm and TDR

. A full and detailed CTMP would be prepared to outline the mitigation measures that would be suitable to apply during the construction phase prior to the commencement of the construction phase. Mitigation measures to reduce the potential for dust and dirt to make

its way on to the local highway network would be undertaken including the cleaning of vehicle wheels during wet periods and the sheeting of aggregate lorries.

To reduce the impacts associated with the transport of abnormal loads, early consultation with local residents will include discussions around the timing of abnormal load deliveries and all concerns will be taken into account. A summary of mitigation measures is set out in **Table 8-1**.

The Construction Environmental Management Plan (CEMP) sets out the principles and procedures for environmental management during construction. The CEMP would be revised and updated and would be used by the contractor to ensure that the appropriate environmental management is implemented throughout the construction phase, to include mitigation measures. The CEMP includes information on general construction good practice, including waste management, dust mitigation, vehicle washing, vehicle storage and maintenance, noise management, and on-site vehicle movement.

Table 8-1 Summary of Predicted Effects (Pre and Post-Mitigation)

Summary Effect	Receptor	Sensitivity	Magnitude	Rationale	Significance	Additional Mitigation	Residual Effects
Road safety	Road users in study area	High	Low	The development will increase traffic but the levels would remain within design capacity and impacts will be short lived.	Significant	Traffic Management Plan for the movement of abnormal loads. Construction Traffic Management Plan (CTMP) to be provided.	Not significant
Driver severance & delay	Drivers on roads in study area	Low	Negligible	Expected to be some tolerance to delays and impacts will be short lived.	Not significant	Trial Run for abnormal loads prior to commencement of construction.	Not significant
Community severance & delay	Road users in study area (R426 Timahoe)	Negligible	Low	There are few locations where severance may occur so there is considered to be tolerance to the increase in traffic.	Not significant	Provision of information to local residents and users of amenities, to involve the community in the safe operation of the Traffic Management Plan and to alleviate stress and anxiety.	Not significant
Noise & vibration	Residential properties	Moderate	Negligible	The traffic increase is short lived and so the effects will be temporary.	Not significant		Not significant
Vulnerable road users	Pedestrians/cyclists/motorcyclists	Moderate	Low	The construction period is temporary and the numbers of	Not significant	Good construction practices including	Not significant

Summary of Effect	Receptor	Sensitivity	Magnitude	Rationale	Significance	Additional Mitigation	Residual Effects
				vulnerable road users is low.		wheel wash and careful loading.	
Dust & dirt	Residential properties	Low	Low	The construction period is temporary and the construction site is remote from the public roads.	Not significant		Not significant
Hazardous & dangerous loads	Road users in study area	Moderate	Moderate	The transport of abnormal loads will impact road users and residents.	Significant		Not significant

Residual effects are those that would still occur after mitigation measures have been incorporated into the scheme. Potential residual effects are most likely to be those associated with delivery of the abnormal loads and resultant temporary road closures. As summarised in Table 12.23, those impacts identified as significant will be mitigated through the proposed measures, with the impacts managed to ensure that they are not significant.

8.2 Cable route

For the identified magnitude of impact for each link, the use of traffic management measures in the CTMP such as suitable signage warning users of the temporary road closures and diversions available, have been considered and will be developed as part of the final CTMP, which would need to be approved by XXXX.

Where direct access would be affected by a temporary road closure, the Applicant would liaise with those users directly to ensure minimal disruption as possible whilst an access is temporarily closed, which could include 24 hour working and/ or providing alternative crossing, where appropriate. This would include liaising with the emergency services, to ensure access could be maintained during the closure

9.0 Telecommunications and Aviation

9.1 Telecommunications

9.1.1 Wind Farm

As there is no potential for electromagnetic interference from the proposed project on telecommunications, there are no mitigation measures proposed for the construction, operation or decommissioning phase of the proposed project.

9.1.1.1 Turbine Delivery Route

Overhead telecommunication lines will be placed underground or reinstated following turbine delivery to the site at the end of the construction phase. No mitigation measures are required.

9.1.1.2 Cable Route

The proposed cable route will be left in situ underground within the public roadway. There are no telecommunications or broadcasting mitigation measures proposed. In advance of the cable route 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 avoiding existing services in the road.

9.1.1.3 Recreational Amenity Trail

No mitigation measures are required.

9.2 Aviation

9.2.1 Wind Farm and Turbine Delivery Route

In line with standard practice with wind farm developments, the coordinates and elevations for turbines will be supplied to the IAA and DAA at the end of the construction phase. If

aviation lighting is required by IAA or DAA to affix to the turbines, the developer commits to installing same.

9.2.2 Cable Route and Recreational Amenity Trail

The proposed cable routes will be left in situ underground within the public roadway. There are no aviation related mitigation measures proposed.

10.0 Shadow Flicker

Shadow flicker control modules, consisting of light sensors and specialised software, will be installed on the turbines to that can prevent operation during periods when shadow flicker can be experienced at nearby properties. The installation of a programmable shadow flicker module will allow the control of turbines in order to eliminate shadow flicker. The correct operation of the installed shadow flicker control measures will ensure that there will be no impact from shadow flicker. The operation and performance of the shadow flicker control measures will be monitored on an ongoing basis.

Under the WEG (2006) guidance shut down periods cover the periods of potential nuisance in excess of 30 hrs per year. The applicant is committed to a zero-shadow flicker strategy which means that the . turbines shadow flicker module will be programmed to shut down whenever the conditions for shadow flicker at a property are met.

Under this approach there would be no shadow flicker experienced at any property, and therefore no additional mitigation measures are required.

11.0 Biodiversity

The developer will be responsible for implementing proposed mitigation and compensation during construction and the operator will be responsible for the same during operation and decommissioning.

11.1 Construction

11.1.1 Designated nature conservation Sites, Fisheries and Aquatic Ecology

Mitigation measures to prevent adverse effects on downstream Natura 2000 sites during construction are provided in full in the NIS (Technical Appendix 15.10 found in Volume III of this EIA). These will ensure no deterioration in the quality of water entering the River Barrow and River Nore SAC, the River Nore SPA and Royal Canal pNHA and will ensure there will be impacts on any QI habitats and species. The same is true for IEF non-QI aquatic habitats and species.

These measures are taken from Chapter 9 and the CEMP (Technical Appendix 3.2 found in Volume III of this EIA).

Within the design of the proposal, good practice environmental and pollution control measures will be employed regarding current best practice guidance such as the following:

- CIRIA C648, 'Control of Pollution from Linear Construction Project' (2006);
- CIRIA C532, 'Control of water pollution from construction sites: guidance for consultants and contractors' (2001);
- CIRIA C741, 'Environmental good practice on site guide' (2015, 4th edition);

- CIRIA C697, 'SuDS and Maintenance Manual; (2007);
- IFI, 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites'; and
- Design took account of IFI consultation to minimise the number of watercourse crossings and to ensure there were appropriate set-back distances between any infrastructure and watercourses (see Chapter 9).

Mitigation measures in the NIS include implementing the requirements in the following guidance:

- Forestry and Water Quality Guidelines – Forest Service (DMNR, 2000)13;
- Code of Best Forest Practice – Ireland;
- Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Forest Service, 2009) 15; and
- Forest Operations & Water Quality Guidelines (Coillte, 2009).

The Forest Service of the Department of Agriculture, Fisheries and Food implements the principles of Sustainable Forest Management through its environmental guidelines 'Code for best forestry practice Ireland' and its inspection and monitoring procedures. The Forest Service also has guidance in relation to freshwater pearl mussel: 'Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures' to further develop its commitment to environmental protection. This document gives specific mitigation measures which are mandatory in specific locations and circumstances in the designated Freshwater Pearl Mussel catchments such as the Barrow and Nore. Within these catchments particular emphasis is placed upon the area that lies within 6 km hydrological distance of an identified Freshwater Pearl Mussel (FPM) population. From the River Barrow and River Nore SAC Conservation objectives, the location of Pearl mussel is between 13 km and 20 km from the Proposed Development, and therefore the mitigation methods for FPM will not be required and the 'Forest Service Guideline' will be implemented instead.

A Construction Environment Management Plan (CEMP) and a Surface Water Management Plan (SWMP) incorporating all relevant mitigation measures included in the NIS and the EIAR will be implemented and followed to ensure compliance with the conservation objectives of the River Barrow and River Nore SAC and the River Nore SPA. The CEMP and SWMP is submitted with this application and will be agreed in conjunction with IFI, NPWS and the Planning Authority. The CEMP will be a key construction document that the contractor will be required to comply with in order to ensure the environment is protected. Any further requirements set out as conditions of consent will be included and there will be a schedule of environmental commitments that will include mitigations measures. The CEMP will be used an Environmental Audit Checklist Tool to ensure compliance by the appointed contractor and will be completed during environmental monitoring of the works.

Drainage will be based on a Sustainable Drainage System (SuDS) through minimising, interception, treatment dispersal and dilution. The SWMP specifies how water pollution will not occur as a result of construction activity for the Proposed Development. It has also been designed to regulate the rate of surface water run-off, encourage settlement of sediment locally and to minimise the quantity of sediment laden storm water.

Erosion control (i.e. preventing sediment runoff) is more effective than sediment control for the prevention of water pollution, this principle will be adopted in the SWMP. Erosion control measures are less likely to fail during times of high rainfall, require less maintenance

and are more cost effective. The works programme will include the ensuring the following controls are in place before site clearance or earth works are commenced:

- Erosion control;
- Sediment control;
- Drainage control; and
- Runoff control.

Once works on site have commenced, the area of exposed ground will be minimised, runoff will be prevented from entering the site from adjacent ground, appropriate control and containment measures will be undertaken. Monitoring and maintenance of erosion and sediment controls will occur throughout the Proposed Development. Establishing vegetation as soon as practical where soil is exposed will also be a priority.

All silt and erosion control measures will be based on the peak flow set out in CIRIA (2006).

11.1.2 Erosion and Sediment Control Details

Measures to control erosion and sediment deposition will be incorporated into each element of the Proposed Development. The works have been broken down into the following stages:

- Upgrading of existing drainage network;
- Upgrading of existing access tracks and roadside swales;
- New access tracks;
- Crane hardstanding areas and turbine foundations;
- Substation compound/ temporary construction compound; and
- Cable trenches.

The following measures will be used for each element of work (where relevant):

- Installation of interception drains installed upslope of proposed work areas;
- Silt trap installation at discharge points form trackside swales;
- Blocking of any drains that collect discharge form roadside swales and discharge directly into water courses;
- Perimeter swales to collect dirty surface water runoff from crane hardstanding area/ turbine bases including locations of proposed: check-dams, cross-drains, sediment traps and discharge points ;
- Settlement ponds to facilitate the treatment of potential silt laden water¹⁷; and
- Application of a capping layer of crushed limestone/sandstone to both existing and newly constructed access tracks (to protect underling shale material more prone to sedimentation when used by traffic).

11.1.3 Best Practice Pollution Control Measures

The following best practice pollution control measures will be employed during the construction phase when working in or near (50 m) the minor watercourses in the study

area to prevent the transport of deleterious substances to River Barrow and River Nore SAC, River Nore SPA and Grand Canal pNHA and mobile aquatic receptors:

- Release of suspended solids to all surface waters will be controlled by interception (e.g. silt traps) and management of site run-off. Any surface water run-off must be treated to ensure that it is free from suspended solids, oil or any other polluting materials;
- Silty water shall be treated using silt trays/settlement ponds and temporary interceptors and traps will be installed until such time as permanent facilities are constructed;
- Straw bales or silt fences shall be appropriately located near watercourses to help prevent untreated surface water run-off entering any watercourse;
- All fuels, lubricants and hydraulic fluids will be kept in secure bunded areas away from watercourses. The bunded area will accommodate 110% of the total capacity of the containers within it;
- Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed;
- Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner;
- Fuelling and lubrication will not be conducted within 50 m of watercourses;
- Storage areas, machinery depots and site offices will be located at least 50 m from the nearest watercourse;
- Foul drainage from the site offices and facilities will be properly treated and removed to a suitable treatment facility;
- Spill kits will be made available close to streams and all staff will be properly trained on correct use;
- Disposal of raw or uncured waste concrete will be controlled to ensure that watercourses or other sensitive areas will not be impacted; and
- Attenuation ponds and a constructed wetland shall be designed, allowing 24 hr settlement before discharge into the surrounding watercourses.

Works adjacent to or over water courses will be timed to be carried out outside of the salmonid spawning season and the early life stages of salmonid fish, specifically no works will occur in stream between October and April inclusive. The following guidelines will be followed for instream works and/ or construction of new tracks:

- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016)¹; in summary these are:

¹ Inland Fisheries Ireland (2016) Guidelines on protection of fisheries during construction works in and adjacent to waters

Use of clear span bridges and bottomless culverts in preference to insufficient water depth culverts, culverts with perched inlets, outfalls and excessive slopes.

Bridge foundations should be designed and positioned at least 2.5 metres from the river bank, so there is no impact on riparian habitat.

If a clear span bridge is not viable, any culvert for a crossing structure needs to be made of metal or concrete pipes a minimum of 900mm diameter and be laid in a manner to maintain the existing stream profile.

If culverts are used, these should be positioned where the watercourse is straightest and aligned with the bed.

Allow sufficient depth over bridge aprons/ scour slabs, to allow fish movement.

Any crossing should avoid physical alterations to stream channels that could alter hydrological characteristics, change stream profile (specifically width, depth, gradient and speed).

Any crossing should have capacity to convey the full range of flood flows likely to be encountered, without the crossing being overtopped and allow for passing of debris that might arise).

Crossings need to be covered in clean inert material to allow safe crossing of the widest items of plant and equipment, without cover material being dislodged and entering the water.

Time in water works between July and September .

Creation of fords for access is prohibited.

Crossing of water courses at natural fords is not permitted.

Bank protection works are often required upstream and downstream of new structures to ensure no undercutting or destabilisation, rock armour is preferred to gabions.

Pre- cast concrete should be used whenever possible to prevent risks to aquatic life.

When cast in place concrete is required, all work must be done in the dry and effectively isolated from flowing water for a period sufficient to ensure no leachate from concrete.

Designated impermeable cement washout areas must be provided.

Abstraction of water for dust suppression should not occur where invasive aquatic species have been identified, to prevent spreading of such species and should only occur in large enough waters identified to allow abstraction without adverse effect.

- Guidelines for the crossing of watercourses during the construction of national road schemes (NRA, 2005)². In summary these are:
 - Avoid disturbing watercourses and riverbanks above and below crossings

² National Roads Authority (NRA) Guidelines for the crossing of watercourses during the construction of national road schemes.

- Implementing measures to control or minimise risk of siltation including bunding and diversion of site run-off to settlement ponds, stripping of top soil and covering temporary stockpiles
- Culverts should be constructed to allow the passage of fish and mammals;
- Temporary crossings should not impede fish passage; and
- Where temporary watercourse crossings are required, suitable materials should be used for construction to not give rise to rutting, ponding and silt run-off; and to direct silt run-off to silt lagoons with precise measures specified according to gradient, with buffer zones incorporated between ponds and watercourses.

11.1.4 Additional measures for conserving water quality and aquatic life

Disturbed Sediment Entrainment Mats (SEDIMATS) will be used in all watercourses that drain from the site. These will provide a further level of protection in relation to silt release. These will be installed by the manufacturer's instructions at locations agreed by the NPWS, IFI and the Planning Authority.

Additional measures to protect water quality will be implemented. Lagoon-type sediment trap and plant filtration beds are a recommendation in the Altmüller and Dettmer (2006) study, this will be incorporated into the SWMP and implemented. Although the Altmüller and Dettmer study specifically looked at FPM and the populations are between 13 km (direct-line) and 20 km (instream) distance from the Proposed Development, these measures will further protect water quality and aquatic life.

The CEMP will include details of the machinery and methodology to be employed to undertake the proposed works. This includes details on the exact location of storage materials, and equipment, how access will be managed to limit disturbance outside of the Proposed Development area, protection of water quality with the avoidance of spills and the use of bio-degradable oils. All construction machinery operating near any watercourse will be systematically checked to avoid leaks of oils, hydraulic fluids and fuels.

There will also be a method statement in relation to cleaning machinery and the avoidance of importing/spreading non-native invasive species. Any plant or equipment that may have worked in environments where invasive species are present (including but not restricted to crayfish plague, zebra mussel *Dreissena polymorpha*, curly waterweed *Lagarosiphon major*, Japanese knotweed (and other members of the knotweed family), Indian balsam *Impatiens glandulifera*, giant hogweed *Heracleum mantegazzianum*, *rhododendron ponticum* and New Zealand flatworm), will be suitably cleaned by high pressure hose, disinfected and dried before being used on site to prevent the spread of invasive species. Water used for this washing process will always be intercepted and prevented from draining back into watercourses.

Any stockpiling of material, topsoil or spoil will be within the proposed site compound. All storage and stockpiling of material must be at a minimum of 10 m from any surface water drainage on the site.

Temporary fencing (paling with 25 mm mesh) will be erected around the required site works to delineate the works area and to minimise the potential for disturbance impacts outside of the works area. As no otter holts were identified within the Proposed Development area of the Proposed Development, there is no specific mitigation required

for the protection of this species in relation to relocation/construction of artificial dwellings.

Removal of brush and felled trees near to watercourses and drainage ditches will ensure that no significant acidification of downstream watercourses will occur.

11.1.5 Habitats

The location of the site layout does not overlap with high-value terrestrial habitats and is located almost entirely within commercial conifer plantation and improved grassland. Cable route options are located almost entirely within existing roads and only small lengths will go through commercial conifer plantation, improved grassland and arable cropland. Construction for the majority of the proposed access tracks will involve upgrading existing forestry and farm tracks.

Areas requiring felling to implement bat mitigation buffers has been focused on commercial conifer plantation habitats and small amounts of highly modified/non-native mixed broadleaved woodland. Also, the lengths of trees and hedgerows to be removed has been minimised.

Any treelines or hedgerows removed will be replaced in-situ elsewhere in the Proposed Development Site at appropriate locations (i.e. designed to maximise ecological connectivity and outside of bat mitigation buffers). All new treelines or hedgerows will be planted using native species and in a similar composition to treelines or hedgerows lost.

To avoid widespread disturbance to habitats, access within the Proposed Development site will be restricted to the footprint of the proposed works corridor and no access between different parts of the Proposed Development will be permitted, except via the proposed works corridor. An ECoW will be employed throughout the construction phase to ensure that construction activities do not encroach, unnecessarily, into any important habitats.

11.1.5.1 Rare Flora

No rare flora were recorded during surveys and so no mitigation measures are required.

11.1.5.2 Invasive Plants

A Habitat and Species Management Plan (HASMP) will be used to prevent the spread of invasive and non-native species and is contained in Technical Appendix 15.11 found in Volume III of this EIAR. In particular, quarry material must be treated to ensure that invasive third-schedule Japanese knotweed (plus other non-native plants) is not spread during construction works and any works near watercourses must not spread invasive third-schedule Canadian pondweed.

A pre-construction walkover survey of the works corridor will confirm the presence of any invasive/non-native species that may have escaped into the area since the baseline surveys were conducted.

11.1.5.3 Birds

To avoid widespread disturbance to birds, access will be restricted to the footprint of the proposed works corridor. Measures proposed in Section **Error! Reference source not found.** will prevent deterioration of water quality and adverse effects on birds relying on downstream habitats, such as grey wagtail and kingfisher.

The following will be implemented to reduce the possibility of damage and destruction (and disturbance to sensitive species) to occupied bird nests:

- Clearance of woodlands and uncultivated vegetation i.e. trees and hedgerows (including vegetation removal for creation/maintenance of bat mitigation buffers), will be undertaken outside the main breeding season from March to September inclusive;
- If other site clearance and construction activities are required to take place during the main breeding bird season, pre-commencement survey work will be undertaken to ensure that nest destruction and disturbance is avoided;
- Once vegetation has been removed from the works corridor, these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase e.g. cover for ground nesting species will be made unsuitable for cutting vegetation or tracking over with an excavator; and
- A suitably experienced Ecologist will be employed for the duration of the construction period to make contractors aware of the ornithological sensitivities of the Proposed Development Site and to undertake surveys for nesting birds throughout the construction period, enforcing exclusion areas as required.

11.1.5.4 Terrestrial Mammals (Excluding Bats)

Measures proposed above will prevent deterioration of water quality and adverse effects on mammals relying on downstream habitats, such as otter. Habitat features important for mammals will be retained as much as possible (e.g. hedgerows, treelines and scrub). While commercial conifer plantation and non-native mixed broadleaved woodland will be removed, connectivity between woodland linear habitat features has been retained throughout all phases of the Proposed Development.

A pre-construction walkover survey of the Proposed Development Site will be undertaken. This will search for mammal resting/breeding places, which could change over time. If any are identified, then appropriate exclusion zone(s) will be implemented and construction activities timed to avoid sensitive periods, such as the breeding season or hibernation, as relevant.

The following will be implemented to reduce the possibility of direct and indirect effects on mammals:

- Limiting constructions works to daylight hours;
- Providing exit points for any excavations (e.g. escape planks or spoil runs) so mammals do not become trapped; and
- A suitably qualified Ecologist will be employed for the duration of the construction period to make contractors aware of the mammalian sensitivities of the Proposed Development Site and to undertake surveys for breeding or resting mammals throughout the construction period, enforcing exclusion areas as required.

11.1.5.5 Bats

All hedgerows and treelines that will be lost due to construction will be replaced within the Proposed Development Site (see Section 22.0). This will ensure that there is no net loss of commuting and foraging routes for bats.

Along the cable route options, immediately in advance of construction works, an ecologist will undertake a comprehensive examination of bridges / structures / trees with moderate to high bat roosting potential (see Technical Appendix 15.3) and emergence surveys will be carried out to determine if bats are present following Collins (2016) guidelines.

No active bat roosts were recorded within the main wind farm site. However, given that a period is likely to elapse prior to the commencement of construction, it is acknowledged that roosting bats could occupy PRFs, such as ivy clad trees with occasional holes/fissures. Therefore, pre-construction roost surveys will be undertaken to identify and protect any bats occupying roosts in vegetation earmarked for removal.

Any trees identified as supporting moderate to high potential roost features within the works corridor will be targeted with further surveys, including emergence/re-entry surveys and/or roost inspections (using endoscopes and thermal imaging cameras). Surveys will determine occupancy, the type of roost (e.g. maternity, hibernation, mating, transitional), species using the roost and the level of occupancy. Surveys will be conducted by appropriately experienced ecologists. For any occupied roost sites, where vegetation removal is proposed, these surveys will inform a derogation license application process (from the NPWS) to undertake appropriate mitigation actions, as required, to ensure the conservation of bats. Such actions could include measures to exclude bats from potential roost holes prior to vegetation removal and provision of alternative roost sites.

Regarding felling of trees with moderate to high potential roost feature, if emergence and roost inspection survey fail to detect bats, then 'soft felling' will be implemented (NRA, 2005). This must be carried out in suitable weather conditions and at appropriate times of year. Briefly, this involves the following:

- Removal of the tree in sections, starting with the top branches and working down the trunk avoiding cutting through cavities;
- Lowering of any sections with potential roost features with care, positioning them on the ground with potential entrances to roosts facing upwards to allow bats to exist the roost; and
- Leaving these sections in place for at least 24 hours in suitable weather.

For occupied roost sites where no vegetation removal is proposed, an exclusion zone will be implemented to avoid disturbance. This exclusion zone will only be implemented according to when and how the roost is used and will be proportional to the disturbance levels from the construction activity. For example, 30 m is an appropriate exclusion zone for piling. In general the following applies:

- Maternity roosts: works should be carried out between 1 October to 1 May inclusive;
- Summer roost (not a maternity roost): works should be carried out between 1 September to 1 May inclusive;
- Hibernation roost: works should be carried out between 1 May to 1 October inclusive; and
- Mating/swarming roost: works should be carried out between 1 November to 1 August inclusive.

The following will also be implemented to reduce the possibility of direct and indirect effects on bat species: no night-time lighting will be used during construction.

11.1.5.6 Other Protected Fauna

Pre-construction checks will be undertaken for spawning frogs if construction works are undertaken in February. Adults and spawn will be translocated to suitable alternative locations if present. Pitfall traps and drift fences will be used to capture adult frogs. Log piles will be created to offer shelter for amphibians.

Amphibian-proof fencing close to any ponds/pools will be used to prevent frogs from accessing any parts of the Proposed Development most hazardous to amphibians during the construction phase.

Insect hotels will be erected to help offset the loss of any insect resting/breeding locations.

11.2 Operational

11.2.1 Designated Nature Conservation Sites, fisheries and Aquatic Ecology

Mitigation measures to protect water quality are shown in Chapter 9 and in Appendix 3.2. Maintenance of the wind farm drainage system will ensure the system is operating effectively and will be undertaken following the CIRIA C697 SuDS and Maintenance Manual. A review of the ecological mitigation measures will be required during the operational phase and Proposed Development specific mitigation will be provided as appropriate where further measures are required. The following mitigation measures are generic and can be added to:

- Site access will be restricted by gates to prevent illegal dumping , use by off road vehicles etc; and
- As during construction, any stockpiled material will be within the proposed site compound and a minimum of 10 m from any surface water drainage.

This will prevent any negative effects on downstream aquatic receptors and designated sites.

11.2.2 Birds

11.2.2.1 Reduction in Habitat Suitability

The species assessed most likely to collide with operational turbines was common kestrel.

Mitigation to limit common kestrel foraging activity around turbines will be implemented. This will include the following measures to reduce prey availability in an area of 103 m surrounding each turbine:

- Creation of uniformly short vegetation heights via stripping of topsoil and infrequent mowing of vegetation;
- Removal of timber/brush from felling and chipping of tree stumps to ground level;
- Spread and compaction of chipped wood and spoil to create a flat surface to prevent rapid colonisation of new vegetation; and
- Piping/filling over of open field/forestry drains.
- Full details are included in Technical Appendix 15.11 found in Volume III of this EIAR.

11.2.3 Terrestrial Mammals (Excluding Bats)

Connectivity between woodland habitats and linear features will be retained. Any treelines and hedgerows due to be lost at the construction phase will be reinstated elsewhere within the Proposed Development Site using like-for-like planting. This will ensure no net loss of linear habitats.

Mitigation measures to protect water quality in Chapter 9 and Appendix 3.2 will avoid significant downstream effects on otter. See Section 20.1.1 for further details.

11.2.4 Bats

11.2.4.1 Bat Mitigation Buffers

This measure will help avoid collision and barotrauma by removing habitat features used by commuting and foraging bats in proximity of turbines. NatureScot (2021) guidelines state that a 50 m distance from the blade tips of the turbine to the nearest habitat feature must be maintained free of trees and shrubs for the duration of wind farm operation. The following formula is used:

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

Where b = buffer radius, bl = blade length, hh = hub height, fh = feature height (all in metres).

Thus, the buffer radius is given as the horizontal distance from the turbine tower and relates to both the habitat feature height, the turbine hub height and the blade length. Taller habitat features require a larger horizontal buffer radius. Note that feature heights were assumed as the maximum height that could be obtained over the lifespan of the Proposed Development. For woodland habitats and treelines, this height was assumed to be 20 m based on the heights of the conifer plantation being felled during surveys. For hedgerows and scrub, this height was 5 m based on the maximum height of hedgerows being maintained by landowners during surveys.

For the turbine dimensions, a worst-case scenario was adopted with dimensions from the Vestas 162 candidate turbine adopted i.e. a blade length of 79.35 m and a hub height of 99 m. This corresponds to a woodland and treeline buffer radius of 103 m and a hedgerow buffer radius of 89 m. Details of the bat mitigation buffers required for each turbine are set out in **Table 11-1**.

Table 11-1 Details of bat mitigation buffers required for each turbine

Turbine Number	Habitat feature	Area (ha) / length (m) to be removed
T1	Hedgerows	- / 21
	Treelines	- / 118
	Mixed broadleaved woodland	0.1 / -
	Conifer plantation	1.0 / -
	Scrub	0.3 / -
T2	Conifer plantation	1.9 / -
	Recently-felled woodland	1.5 / -
T3	Conifer plantation	5.6 / -
	Mixed broadleaved woodland	0.1 / -
T4	Conifer plantation	1.3 / -
	Scrub	0.3 / -
T5	Hedgerows	- / 297
	Treelines	- / 23
	Conifer plantation	0.3 / -
	Mixed broadleaved woodland	0.3 / -
T6	Conifer plantation	3.0 / -
	Mixed broadleaved woodland	0.1 / -
T7	Conifer plantation	3.3 / -
T8	Recently felled woodland	3.3 / -
T9	Conifer plantation	3.3 / -
T10	Conifer plantation	3.3 / -
T11	Conifer plantation	2.9 / -
	Mixed broadleaved woodland	0.4 / -
T12	Conifer plantation	3.3 / -
T13	Conifer plantation	2.9 / -
	Scrub	0.2 / -

The area where trees/scrub is cleared to create the bat mitigation buffers will be kept clear over the lifetime of the Proposed Development and will be made as unfavourable to bats as possible. Felled timber and branches will be removed with stumps brashed to ground level. Excess soil will be deposited over stumps to flatten the ground

11.2.4.2 Turbine Curtailment

It is predicted that bat mitigation buffers will limit bat activity near turbines, reducing potential collision risk.

In addition, the following operational mitigation measures for bats may be implemented depending on the results of the proposed monitoring programme (see Section 24.2):

- **Feathering of Blades.** There is evidence that bat casualties at wind farms is reduced by pitching the blades out of the wind (“feathering”) to reduce rotation speeds below 2 r.p.m. while idling. As such, the feathering of blades to prevent ‘idling’ during low wind speeds is proposed for all turbines; and
- **Curtailement.** This involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed, as above. This will only occur where feathering below cut-in normal speed (above) will not provide sufficient reduction in risk to bats. The curtailement is achieved by feathering (not the actual braking of the turbine) so that the blades continue to rotate slowly (at ~2 r.p.m. or less). Curtailement will be implemented via a system of adaptive management. Thus, if bat carcasses are recorded during post-construction monitoring, cut-in speeds will be increased at the relevant turbines during the bat activity season (April-October) or where temperatures are optimal for bat activity.

It is important to reiterate that the implementation of the above operational phase measures (feathering of blades or curtailement) will only be implemented where the results of post-commissioning monitoring demonstrate a notable adverse effect on bats. It is the conclusion of this assessment that, with the removal of vegetation within the above-referenced buffer zones, that the characteristics of the Proposed Development Site, for bats, will be highly altered and the turbine locations are unlikely to be suitable for bat activity. Consequently, it is assessed that the implementation of the buffer zones will ensure the avoidance of significant effects on bats. In the unlikely event of notable fatalities, a further suite of measures will be implemented.

11.2.4.3 Bat Boxes

To help offset any negative effects of collision on bat populations, 30 no. bat boxes will be erected around the Proposed Development Site away from turbine locations. Full details are included in Technical Appendix 15.11.

11.3 Decommissioning

Mitigation measures for decommissioning will be similar to those for the construction phase, however the magnitude required will be less, as track and turbine installation will not be required.

11.4 CEMP

Ecology

Mitigation measures to prevent adverse effects on downstream Natura 2000 sites during construction are provided in full in the NIS (Technical Appendix 15.10). These will ensure no deterioration in the quality of water entering the River Barrow and River Nore SAC, the River Nore SPA and Royal Canal pNHA and will ensure there will be impacts on any QI habitats and species. The same is true for IEF non-QI aquatic habitats and species.

All site personnel shall be briefed upon the presence of sensitive habitats and potential/confirmed presence of protected species as well as agreed appropriate working methods. An emergency response procedure will be communicated in the event of site personnel suspecting or detecting the presence of a protected species during works. In the

event that a protected species is encountered within or near the working area, works will cease and the ECoW be contacted immediately for advice on appropriate working methods and when works can safely proceed.

Designated Nature Conservation Sites, Fisheries and Aquatic Ecology

The Forest Service of the Department of Agriculture, Fisheries and Food implements the principles of Sustainable Forest Management through its environmental guidelines 'Code for best forestry practice Ireland' and its inspection and monitoring procedures. The Forest Service also has guidance in relation to freshwater pearl mussel: 'Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures' to further develop its commitment to environmental protection. This document gives specific mitigation measures which are mandatory in specific locations and circumstances in the designated Freshwater Pearl Mussel catchments such as the Barrow and Nore. Within these catchments particular emphasis is placed upon the area that lies within 6 km hydrological distance of an identified Freshwater Pearl Mussel (FPM) population. From the River Barrow and River Nore SAC Conservation objectives, the location of Pearl mussel is between 13 km and 20 km from the Project, and therefore the mitigation methods for FPM will not be required and the 'Forest Service Guideline' will be required instead.

Habitats

The location of the site layout does not overlap with high-value terrestrial habitats and is located almost entirely within commercial conifer plantation and improved grassland. GCR options are located almost entirely within existing roads and only small lengths will go through commercial conifer plantation, improved grassland and arable cropland. Construction for the majority of the proposed access tracks will involve upgrading existing forestry and farm tracks.

Areas requiring felling to implement bat mitigation buffers has been focused on commercial conifer plantation habitats and small amounts of highly modified/non-native mixed broadleaved woodland. Also, the lengths of trees and hedgerows to be removed has been minimised.

Any treelines or hedgerows removed will be replaced in-situ elsewhere in the Project Site at appropriate locations (i.e. designed to maximise ecological connectivity and outside of bat mitigation buffers). All new treelines or hedgerows will be planted using native species and in a similar composition to treelines or hedgerows lost.

To avoid widespread disturbance to habitats, access within the proposed development site will be restricted to the footprint of the proposed works corridor and no access between different parts of the proposed development will be permitted, except via the proposed works corridor. An ECoW will be employed throughout the construction phase to ensure that construction activities do not encroach, unnecessarily, into any important habitats.

11.4.1 Designated Nature Conservation Sites, Fisheries and Aquatic Ecology

Mitigation measures to prevent adverse effects on downstream Natura 2000 sites during construction are provided in full in the NIS (Technical Appendix 15.10). These will ensure no deterioration in the quality of water entering the River Barrow and River Nore SAC, the River Nore SPA and Royal Canal pNHA and will ensure there will be impacts on any QI habitats and species. The same is true for IEF non-QI aquatic habitats and species. These measures are taken from Chapter 9 and the CEMP. Mitigation measures in the NIS include:

- Forestry and Water Quality Guidelines – Forest Service (DMNR, 2000)13;

- Code of Best Forest Practice – Ireland;
- Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Forest Service, 2009) 15; and
- Forest Operations & Water Quality Guidelines (Coillte, 2009).

Within the design of the proposal, good practice environmental and pollution control measures are employed regarding current best practice guidance such as, but not limited to, the following:

- CIRIA C648, 'Control of Pollution from Linear Construction Project' (2006);
- CIRIA C532, 'Control of water pollution from construction sites: guidance for consultants and contractors' (2001);
- CIRIA C741, 'Environmental good practice on site guide' (2015, 4th edition);
- CIRIA C697, 'SuDS and Maintenance Manual; (2007);
- IFI, 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites'; and

Design took account of IFI consultation to minimise the number of watercourse crossings and to ensure there were appropriate set-back distances between any infrastructure and watercourses (see Chapter 9).

Mitigation measures in the NIS include:

- Forestry and Water Quality Guidelines – Forest Service (DMNR, 2000)13;
- Code of Best Forest Practice – Ireland;
- Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Forest Service, 2009) 15; and
- Forest Operations & Water Quality Guidelines (Coillte, 2009).

The Forest Service of the Department of Agriculture, Fisheries and Food implements the principles of Sustainable Forest Management through its environmental guidelines 'Code for best forestry practice Ireland' and its inspection and monitoring procedures. The Forest Service also has guidance in relation to freshwater pearl mussel: 'Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures' to further develop its commitment to environmental protection. This document gives specific mitigation measures which are mandatory in specific locations and circumstances in the designated Freshwater Pearl Mussel catchments such as the Barrow and Nore. Within these catchments particular emphasis is placed upon the area that lies within 6 km hydrological distance of an identified Freshwater Pearl Mussel (FPM) population. From the River Barrow and River Nore SAC Conservation objectives, the location of Pearl mussel is between 13 km and 20 km from the Project, and therefore the mitigation methods for FPM will not be required and the 'Forest Service Guideline' will be required instead.

A Construction Environment Management Plan (CEMP) and a Surface Water Management Plan (SWMP) incorporating all mitigation measures included in the NIS and the EIAR will be developed and followed to ensure compliance with the conservation objectives of the River Barrow and River Nore SAC and the River Nore SPA. The CEMP and SWMP will be drawn up and agreed in conjunction with IFI, NPWS and the Planning Authority. Any further requirements set out as conditions of consent will be included and there will be a schedule of environmental commitments that will include mitigations measures. The CEMP will be

used an Environmental Audit Checklist Tool to ensure compliance by the appointed contractor and will be completed during environmental monitoring of the works.

Drainage will be based on a Sustainable Drainage System (SuDS) through minimising, interception, treatment dispersal and dilution. The SWMP specifies how water pollution will not occur as a result of construction activity for the Project. It has also been designed to regulate the rate of surface water run-off, encourage settlement of sediment locally and to minimise the quantity of sediment laden storm water.

Erosion control (i.e. preventing sediment runoff) is more effective than sediment control for the prevention of water pollution, this principle will be adopted in the SWMP. Erosion control measures are less likely to fail during times of high rainfall, require less maintenance and are more cost effective. The works programme will include the ensuring the following controls are in place before site clearance or earth works are commenced

- Erosion control;
- Sediment control;
- Drainage control; and
- Runoff control.

Once works on site have commenced, the area of exposed ground will be minimised, runoff will be prevented from entering the site from adjacent ground, appropriate control and containment measures will be undertaken. Monitoring and maintenance of erosion and sediment controls will occur throughout the project. Establishing vegetation as soon as practical where soil is exposed will also be a priority. All silt and erosion control measures will be based on the peak flow set out in CIRIA (2006).

11.4.2 Erosion and sediment control details

All silt and erosion control measures will be based on the peak flow set out in CIRIA (2006). Measures to control erosion and sediment deposition will be incorporated into each element of the Project. The works have been broken down into the following stages:

- Upgrading of existing drainage network;
- Upgrading of existing access tracks and roadside swales;
- New access tracks;
- Crane hardstanding areas and turbine foundations;
- Substation compound/ temporary construction compound; and
- Cable trenches.

The following measures will be used for each element of work (where relevant):

- Installation of interception drains installed upslope of proposed work areas;
- Silt trap installation at discharge points from trackside swales;
- Blocking of any drains that collect discharge from roadside swales and discharge directly into water courses;

- Perimeter swales to collect dirty surface water runoff from crane hardstanding area/ turbine bases including locations of proposed: check-dams, cross-drains, sediment traps and discharge points³;
- Settlement ponds to facilitate the treatment of potential silt laden water³; and
- Application of a capping layer of crushed limestone/sandstone to both existing and newly constructed access tracks (to protect underling shale material more prone to sedimentation when used by traffic).

11.4.3 Best practice pollution control measures

The following best practice pollution control measures will be employed during the construction phase when working in or near the minor watercourses in the study area to prevent the transport of deleterious substances to River Barrow and River Nore SAC, River Nore SPA and Grand Canal pNHA and mobile aquatic receptors:

- Release of suspended solids to all surface waters will be controlled by interception (e.g. silt traps) and management of site run-off. Any surface water run-off must be treated to ensure that it is free from suspended solids, oil or any other polluting materials;
- Silty water shall be treated using silt trays/settlement ponds and temporary interceptors and traps will be installed until such time as permanent facilities are constructed;
- Straw bales or silt fences shall be appropriately located near watercourses to help prevent untreated surface water run-off entering any watercourse;
- All fuels, lubricants and hydraulic fluids will be kept in secure bunded areas away from watercourses. The bunded area will accommodate 110% of the total capacity of the containers within it;
- Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed;
- Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner;
- Fuelling and lubrication will not be conducted within 50 m of watercourses;
- Storage areas, machinery depots and site offices will be located at least 50 m from the nearest watercourse;
- Foul drainage from the site offices and facilities will be properly treated and removed to a suitable treatment facility;
- Spill kits will be made available close to streams and all staff will be properly trained on correct use;
- Disposal of raw or uncured waste concrete will be controlled to ensure that watercourses or other sensitive areas will not be impacted; and

³ All such features to be assigned unique reference number to facilitate ongoing inspection and monitoring of same during the course of the works.

- Attenuation ponds and a constructed wetland shall be designed, allowing 24 hr settlement before discharge into the surrounding watercourses.
- Works adjacent to or over water courses will be timed to be carried out outside of the salmonid spawning season and the early life stages of salmonid fish, specifically no works will occur in stream between October and April inclusive. The following guidelines will be followed for instream works and/ or construction of new tracks.
- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016); and
- Guidelines for the crossing of watercourses during the construction of national road schemes (NRA, 2008).

11.4.4 Additional measures for conserving water quality and aquatic life

Disturbed Sediment Entrainment Mats (SEDIMATS) will be used in all watercourses that drain from the site. These will provide a further level of protection in relation to silt release. These will be installed by the manufacturer's instructions at locations agreed by the NPWS, IFI and the Planning Authority.

Additional measures to protect water quality are recommended. Lagoon-type sediment trap and plant filtration beds are a recommendation in the Altmüller and Dettmer (2006) study, this will be incorporated into the SWMP. Although the Altmüller and Dettmer study specifically looked at FPM and the populations are between 13 km (direct-line) and 20 km (instream) distance from the Project, these recommendations will further protect water quality and aquatic life.

The CEMP will include details of the machinery and methodology to be employed to undertake the proposed works. This includes details on the exact location of storage materials, and equipment, how access will be managed to limit disturbance outside of the Project area, protection of water quality with the avoidance of spills and the use of bio-degradable oils. All construction machinery operating near any watercourse will be systematically checked to avoid leaks of oils, hydraulic fluids and fuels.

There will also be a method statement in relation to cleaning machinery and the avoidance of importing/spreading non-native invasive species. Any plant or equipment that may have worked in environments where invasive species are present (including but not restricted to crayfish plague, zebra mussel *Dreissena polymorpha*, curly waterweed *Lagarosiphon major*, Japanese knotweed (and other members of the knotweed family), Indian balsam *Impatiens glandulifera*, giant hogweed *Heracleum mantegazzianum*, *rhododendron ponticum* and New Zealand flatworm), shall be suitably cleaned by high pressure hose, disinfected and dried before being used on site to prevent the spread of invasive species. Water used for this washing process shall always be intercepted and prevented from draining back into watercourses.

Any stockpiling of material, topsoil or spoil will be within the proposed site compound. All storage and stockpiling of material must be at a minimum of 10 m from any surface water drainage on the site.

Temporary fencing (paling with 25 mm mesh) will be erected around the required site works to delineate the works area and to minimise the potential for disturbance impacts outside of the works area. As no otter holts were identified within the Project area of the proposed development, there is no specific mitigation required for the protection of this species in relation to relocation/construction of artificial dwellings. Removal of brash and

felled trees near to watercourses and drainage ditches will ensure that no significant acidification of downstream watercourses will occur.

11.4.4.1 Habitats

The location of the site layout does not overlap with high-value terrestrial habitats and is located almost entirely within commercial conifer plantation and improved grassland. GCR options are located almost entirely within existing roads and only small lengths will go through commercial conifer plantation, improved grassland and arable cropland. Construction for the majority of the proposed access tracks will involve upgrading existing forestry and farm tracks.

Areas requiring felling to implement bat mitigation buffers has been focused on commercial conifer plantation habitats and small amounts of highly modified/non-native mixed broadleaved woodland. Also, the lengths of trees and hedgerows to be removed has been minimised.

Any treelines or hedgerows removed will be replaced in-situ elsewhere in the Project Site at appropriate locations (i.e. designed to maximise ecological connectivity and outside of bat mitigation buffers). All new treelines or hedgerows will be planted using native species and in a similar composition to treelines or hedgerows lost.

To avoid widespread disturbance to habitats, access within the proposed development site will be restricted to the footprint of the proposed works corridor and no access between different parts of the proposed development will be permitted, except via the proposed works corridor. An ECoW will be employed throughout the construction phase to ensure that construction activities do not encroach, unnecessarily, into any important habitats.

11.4.4.2 Rare Flora

No rare flora was recorded during surveys and so no mitigation measures are required.

11.4.4.3 Invasive Plants

A Habitat and Species Management Plan (HASMP) will be used to prevent the spread of invasive and non-native species and is contained in Appendix 15.11. In particular, quarry material must be treated to ensure that invasive third-schedule Japanese knotweed (plus other non-native plants) is not spread during construction works and any works near watercourses must not spread invasive third-schedule Canadian pondweed.

A pre-construction walkover survey of the works corridor will confirm the presence of any invasive/non-native species that may have escaped into the area since the baseline surveys were conducted.

11.4.4.4 Avifauna

To avoid widespread disturbance to birds, access will be restricted to the footprint of the proposed works corridor. Measures proposed will prevent deterioration of water quality and adverse effects on birds relying on downstream habitats, such as grey wagtail and kingfisher.

11.4.4.5 Terrestrial Mammals (Excluding Bats)

To avoid widespread disturbance to birds, access will be restricted to the footprint of the proposed works corridor. Measures proposed in Section 11.1 will prevent deterioration of

water quality and adverse effects on birds relying on downstream habitats, such as grey wagtail and kingfisher.

The following will be implemented to reduce the possibility of damage and destruction (and disturbance to sensitive species) to occupied bird nests:

- Clearance of woodlands and uncultivated vegetation i.e. trees and hedgerows (including vegetation removal for creation/maintenance of bat mitigation buffers), will be undertaken outside the main breeding season from March to September inclusive;
- If other site clearance and construction activities are required to take place during the main breeding bird season, pre-commencement survey work will be undertaken to ensure that nest destruction and disturbance is avoided;
- Once vegetation has been removed from the works corridor, these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase e.g. cover for ground nesting species will be made unsuitable for cutting vegetation or tracking over with an excavator; and
- A suitably experienced Ecologist will be employed for the duration of the construction period to make contractors aware of the ornithological sensitivities of the Proposed Development Site and to undertake surveys for nesting birds throughout the construction period, enforcing exclusion areas as required.

11.4.4.6 Bats

All hedgerows and treelines that will be lost due to construction will be replaced within the Project Site. This will ensure that there is no net loss of commuting and foraging routes for bats.

Along the GCR options, immediately in advance of construction works, an ecologist will undertake a comprehensive examination of bridges at aquatic survey sites A12 (insert GCR 2) and emergence survey will be carried out to determine if bats are present in accordance with Collins (2016) guidelines.

No active bat roosts were recorded within the main wind farm site. However, given that a period is likely to elapse prior to the commencement of construction, it is acknowledged that roosting bats could occupy PRFs, such as ivy clad trees with occasional holes/fissures. Therefore, pre-construction roost surveys will be undertaken to identify and protect any bats occupying roosts in vegetation earmarked for removal.

Any trees identified as supporting moderate to high potential roost features within the works corridor will be targeted with further surveys, including emergence/re-entry surveys and/or roost inspections (using endoscopes and thermal imaging cameras). Surveys will determine occupancy, the type of roost (e.g. maternity, hibernation, mating, transitional), species using the roost and the level of occupancy. Surveys will be conducted by appropriately experienced ecologists. For any occupied roost sites, where vegetation removal is proposed, these surveys will inform a derogation license application process (from the NPWS) to undertake appropriate mitigation actions, as required, to ensure the conservation of bats. Such actions could include measures to exclude bats from potential roost holes prior to vegetation removal and provision of alternative roost sites.

Regarding felling of trees with moderate to high potential roost feature, if emergence and roost inspection survey fail to detect bats, then 'soft felling' will be implemented (NRA,

2005). This must be carried out in suitable weather conditions and at appropriate times of year. Briefly, this involves the following:

- Removal of the tree in sections, starting with the top branches and working down the trunk avoiding cutting through cavities;
- Lowering of any sections with potential roost features with care, positioning them on the ground with potential entrances to roosts facing upwards to allow bats to exist the roost; and
- Leaving these sections in place for at least 24 hours in suitable weather.

For occupied roost sites where no vegetation removal is proposed, an exclusion zone will be implemented to avoid disturbance. This exclusion zone will only be implemented according to when and how the roost is used and will be proportional to the disturbance levels from the construction activity. For example, 30 m is an appropriate exclusion zone for piling. In general the following applies:

- Maternity roosts: works should be carried out between 1 October to 1 May inclusive;
- Summer roost (not a maternity roost): works should be carried out between 1 September to 1 May inclusive;
- Hibernation roost: works should be carried out between 1 May to 1 October inclusive; and
- Mating/swarming roost: works should be carried out between 1 November to 1 August inclusive.

11.4.4.7 Other Protected Fauna

- Pre-construction checks will be undertaken for spawning frogs if construction works are undertaken in February. Adults and spawn will be translocated to suitable alternative locations if present. Pitfall traps and drift fences will be used to capture adult frogs. Log piles will be created to offer shelter for amphibians.
- Amphibian-proof fencing close to any ponds/pools will be used to prevent frogs from accessing any parts of the Project most hazardous to amphibians during the construction phase.
- Insect hotels will be erected to help offset the loss of any insect resting/breeding locations.

11.5 Operation

11.5.1 Designated Nature Conservation Sites, Fisheries and Aquatic Ecology

Mitigation measures to protect water quality are shown in Chapter 9 and in Appendix 3.2. Maintenance of the wind farm drainage system will ensure the system is operating effectively and will be undertaken in accordance with CIRIA C697 SuDS and Maintenance Manual. A review of the ecological mitigation measures will be required during the operational phase and Project specific mitigation will be provided as appropriate where further measures are required. The following mitigation measures are generic and can be added to:

- Site access will be restricted by gates to prevent illegal dumping, use by off road vehicles etc; and

- As during construction, any stockpiled material will be within the proposed site compound and a minimum of 10 m from any surface water drainage.
- This will prevent any negative effects on downstream aquatic receptors and designated sites.

11.5.1.1 Avifauna

The species assessed most likely to collide with operational turbines was common kestrel. Mitigation to limit common kestrel foraging activity around turbines will be implemented. This will include the following measures to reduce prey availability in an area of 103 m surrounding each turbine:

- Creation of uniformly short vegetation heights via grazing/mowing;
- Removal of timber/brush from felling and chipping of tree stumps to ground level;
- Spread of chipped wood and spoil to create a flat surface for re-seeding; and
- Piping/filling over of open field/forestry drains.

To deter hen harrier from moving into the area and becoming at risk of collision from turbines, any areas where felling is required to accommodate temporary infrastructure (e.g. temporary construction compound) will be kept free of trees over the lifespan of the Project. As hen harriers are known to breeding pre-thicket conifer plantation, this will prevent the Project Site from becoming more attractive to them. As an added benefit, these clearings will provide potential breeding habitat for woodcock.

For common kestrel, common snipe and Eurasian woodcock, enhancement measures are proposed to offset any low levels of direct or indirect effects of low significance on local populations.

Five no. nest boxes will be provided for common kestrels to increase productivity in the local area and offset potential negative direct operational effects. This will help the species avoid inter-specific nest site competition with other raptors such as buzzards. The nest boxes will be located at appropriate locations around the edge of the Proposed Development Site, thus avoiding placement near turbines.

As mentioned previously, forested areas felled for temporary infrastructure will be maintained free from trees for the lifespan of the Proposed Development to help provide potential breeding habitat for woodcock. This will consist of 3 no. glades.

For snipe, 10 new wetland areas (wader scrapes) of 20 m² will be created in existing fields to encourage and promote breeding. For moderate quality wet grassland derived from improved grassland, approximately 2 pairs per km² (or 100 ha) could be expected (Hoodless, Ewald and Baines 2007). Therefore, 50 ha of suitable habitat (enough for 1 pair) will be managed for snipe which will include continued but low intensity grazing by farm animals and the new wetland areas.

Opportunities for nesting peregrine will be created in the quarry to be used as a borrow pit. This will be in the form of three ledges, either created by blasting or as artificial platforms bolted to the rock surface in suitable positions on the quarry face.

As one of the objectives of Laois County Council Development Plan 2021-2017 is to erect nest boxes for swift, a swift nest tower will be installed in appropriate locations away from turbines.

11.5.1.2 Terrestrial Mammals (Excluding Bats)

Connectivity between woodland habitats and linear features will be retained. Any treelines and hedgerows due to be lost at the construction phase will be reinstated elsewhere within the Project Site using like-for-like planting. This will ensure no net loss of linear habitats.

Mitigation measures to protect water quality in Chapter 9 and Appendix 3.2 will avoid significant downstream effects on otter. See Section 11.1 for further details.

11.5.1.3 Bats

This measure will help avoid collision and barotrauma by removing habitat features used by commuting and foraging bats in proximity of turbines. NatureScot (2021) guidelines state that a 50 m distance from the blade tips of the turbine to the nearest habitat feature must be maintained for the duration of wind farm operation. The following formula is used:

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

Where b = buffer radius, bl = blade length, hh = hub height, fh = feature height (all in metres).

Thus, the buffer radius is given as the horizontal distance from the turbine tower and relates to both the habitat feature height, the turbine hub height and the blade length. Taller habitat features require a larger horizontal buffer radius. Note that feature heights were assumed as the maximum height can be obtained over the lifespan of the Project. For woodland habitats and treelines, this height was assumed to be 20 m based on the heights of the conifer plantation being felled during surveys. For hedgerows and scrub, this height was 5 m based on the maximum height of hedgerows being maintained by landowners during surveys.

For the turbine dimensions, a worst-case scenario was adopted with dimensions from the Vestas 162 candidate turbine adopted i.e. a blade length of 79.35 m and a hub height of 99 m. The corresponded to a woodland and treeline buffer radius of 103 m and a hedgerow buffer radius of 89 m.

Details of the buffers required for each turbine are shown in **Table 11-1**.

The area where trees/scrub is cleared to create the bat mitigation buffers will be kept clear over the lifetime of the Project and will be made as unfavourable to bats as possible. Felled timber and branches will be removed with stumps brushed to ground level. Excess soil will be deposited over stumps to flatten the ground.

With regards to turbine curtailment, it is predicted that bat mitigation buffers will limit bat activity near turbines, reducing potential collision risk. In addition, the following operational mitigation measures for bats may be implemented depending on the results of the proposed monitoring programme (see Section 11.9.4):

- Feathering of Blades. There is evidence that bat casualties at wind farms is reduced by pitching the blades out of the wind ("feathering") to reduce rotation speeds below 2 r.p.m. while idling. As such, the feathering of blades to prevent 'idling' during low wind speeds is proposed for all turbines; and
- Curtailment. This involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed, as above. This will only occur where feathering below cut-in normal speed (above) will not provide sufficient reduction in risk to bats. The curtailment is achieved by

feathering (not the actual braking of the turbine) so that the blades continue to rotate slowly (at ~2 r.p.m. or less). Curtailment will be implemented via a system of adaptive management. Thus, if bat carcasses are recorded during post-construction monitoring, cut-in speeds will be increased at the relevant turbines during the bat activity season (April-October) or where temperatures are optimal for bat activity.

It is important to reiterate that the implementation of the above operational phase measures (feathering of blades or curtailment) will only be implemented where the results of post-commissioning monitoring demonstrate a notable adverse effect on bats. It is the conclusion of this assessment that, with the removal of vegetation within the above-referenced buffer zones, that the characteristics of the Project Site, for bats, will be highly altered and the turbine locations are unlikely to be suitable for bat activity. Consequently, it is assessed that the implementation of the buffer zones will ensure the avoidance of significant effects on bats. In the unlikely event of notable fatalities, a further suite of measures will be implemented.

With respect to bat boxes, to help offset any negative effects of collision on bat populations, bat boxes will be erected around the Project Site away from turbine locations.

11.6 Decommissioning

Mitigation measures for decommissioning will be similar to those for the construction phase, however the magnitude required will be less, as track and turbine installation will not be required.

11.7 Compensation Measures

Full details of compensation measures are included in Technical Appendix 15.11.

11.7.1 Replacement planting

Following DAFM (DAFM, 2017) guidance, 52.78 ha of replacement woodland will be planted ex situ. This will compensate for the loss of woodland habitats permanently felled to accommodate the Proposed Development.

Any forestry lost to temporary infrastructure (e.g. site compounds, swept path and hard standings) will be replaced in situ. This amounts to 1.3 ha. This will not be replaced with conifer plantation in situ to reduce the suitability of the Site for hen harrier. Native broadleaved habitats will be created elsewhere, which will also have the added benefit of providing more suitable habitats for mammals and birds.

To compensate for the loss of linear treeline and hedgerow habitats, 141 m of treelines will be replaced, and 938 m of hedgerows will be replaced in situ. The placement of these will be designed to ensure connectivity between habitat features at the Proposed Development Site is maintained and enhanced.

11.8 Biodiversity Enhancement

Enhancement measures are included in Technical Appendix 15.11. These include:

- Erection of nest boxes for barn owl (five boxes) and swift (one swift tower);
- Erection of minimum of three insect hotels per 35 ha;
- Maintenance of a 5 m rough grassland buffer along new access tracks to provide new habitats for pollinators;

- Creation of a minimum of eight log or brash piles for hedgehogs and eight log or brash piles for reptiles and amphibians from hard wood trees and shrubs removed during site clearance; and
- Management of new and existing drainage ditches to benefit amphibians.

11.9 Monitoring

11.9.1 General pre-construction

To prevent accidental disturbance to resting places of mammals (badgers, red squirrel, pine marten, otter and hedgehog), an ecological walkover will be undertaken prior to any construction activities within the development footprint.

Similarly, trees and structures within the works corridor will be re-assessed for bat roosting potential, with any inspections or emergence surveys carried out as required under licence. Checks for nesting birds will be required for construction undertaken during the bird breeding season. If nest are recorded, ongoing monitoring and appropriate exclusion zones will be implemented to determine when and where works can proceed.

11.9.2 Water quality

Water quality monitoring will be undertaken as outlined in Chapter 9. This will check the efficacy of mitigation measures.

11.9.3 Birds

Based on current best-practice guidelines (SNH, 2009), it is proposed that a targeted range of flight activity surveys and collision monitoring (carcass searching) are undertaken during the breeding and non-breeding seasons in years 1, 2 and 3 post construction, to monitor the rate of avian turbine collisions and identify any significant unforeseen adverse effects. Thereafter, if the rate of turbine strikes is as low as predicted, the monitoring should no longer be required. If monitoring indicates potentially significant levels of collision mortality for IEF birds, potential mitigation measures will be developed and implemented, and further monitoring will also be considered. Further details of proposed monitoring methods and survey effort, and possible mitigation measures (if required), will be provided to and agreed with the planning authority prior to wind farm operation commencing.

- The applicant welcomes a condition, set by the Planning Authority, covering the agreement and implementation of a bird monitoring plan.

11.9.4 Bats

Post-construction monitoring is required in line with commitments made in respect of the permitted wind farm and should be seen as an opportunity to obtain data on bat/turbine interactions and to allow adaptive management of the proposed mitigation measures.

To reinforce the baseline results and better inform the precise requirements for post-construction monitoring, it is proposed to undertake a year of surveys for bats prior to wind farm construction. This will involve three rounds of static detector surveys (spring, summer and autumn) as per the latest NatureScot (2021) guidance. The results of these surveys will be used to provide an updated baseline environment, for bats, and will form the basis of the post-construction monitoring programme. For example, in the event of high

levels of activity at certain locations across the Proposed Development Site, post-construction monitoring can be adapted to pay particular attention to this location.

Following this additional year of pre-construction monitoring, the results will be used to assess the precise requirements for post-construction monitoring, including methods, timing and duration.

The following individual components of the post-construction monitoring programme will include:

- Static detector surveys. These surveys will allow for a valid comparison of bat activity and Site usage with pre-construction levels. Following NatureScot (2021) guidance, the surveys are to be conducted during years 1, 2 and 3 post construction to allow for annual variation and cumulative effects. Reports will be submitted to the competent authority and NPWS following each year of surveys. Surveys will follow baseline survey methods, as outlined in NatureScot (2021) guidance. After three years of post-construction surveys, the monitoring programme may be extended or halted following agreement with the competent authority and NPWS.
- Fatality Monitoring. If this is determined to be required following the additional year of pre-construction monitoring, this will initially be conducted during years 1, 2 and 3 post construction to allow for annual variation and cumulative effects. The comprehensive fatality monitoring programme for birds as described above will be extended and duplicated to bats for the first three years per the post-construction monitoring requirements recommended by NatureScot (2021). After three years of post-construction surveys, the monitoring programme may be extended or halted following agreement with the competent authority and NPWS.

The results of the post-construction monitoring surveys will be used to determine whether further mitigation measures, such as turbine curtailment, are required.

Bat mitigation buffers will need to be monitored in years 1, 2 and 3 following construction to ensure vegetation clearance and management measures have resulted in the desired habitat conditions. Once these conditions have been achieved, habitats will be maintained in this manner for the duration of the wind farm lifespan.



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