APPENDIX 7

Mitigation and Monitoring

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1. SCHEDULE OF MITIGATION & MONITORING PROPOSALS

All mitigation and monitoring measures relating to the pre-commencement, construction, operational and decommissioning phases of the Proposed Project are set out in the NIS and associated appendices.

All mitigation which will be implemented during the various phases of the Proposed Project to protect the Natura 2000 sites and their qualifying interests are presented in Table 1-1 below.

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

It is intended that the CEMP will be updated where required prior to the commencement of construction to include all mitigation and monitoring measures, planning conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and would be submitted to the Planning Authority for written approval prior to the commencement of development. Similarly the decommissioning plan will be updated and agreed with the local authority prior to the commencement of any decommissioning works.

1.1 NIS Mitigation Measures

Table 1-1 Schedule of Mitigation Measures

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Pre-construction		
MM1	Disturbance/Displacement	Section 6.1 of the AASR/NIS	**Otter** › A pre-commencement otter survey shall be undertaken in accordance with standard best practice guidance prior to the commencement of site works. › Should the surveys identify the presence of an otter holt, the following measures will be undertaken. • A National Parks and Wildlife Service and a derogation licence will be applied for (although compliance with such a licence has not been relied on in this assessment). • No works will be undertaken within 150m of any holts at which breeding females or cubs are present. • No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will also not take place within 15m of such holts, except under licence (TII, 2006). • All of the above works will be undertaken or supervised by an appropriately qualified ecologist. **Kingfisher** To minimise the potential for disturbance to breeding kingfisher, construction works at the River Nore crossing will be undertaken outside the core breeding season (April to July, inclusive). In addition, targeted kingfisher surveys will be undertaken at the Proposed Grid Connection crossing of the River Nore if the works are to commence here between February and September. This precautionary period accounts for early courtship and the potential for multiple/late broods.		

			In addition, the following mitigation measures will be implemented as general disturbance measures: › All plant and equipment for use will comply with Statutory Instrument No 359 of 1996 "European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1996". › Operating machinery will be restricted to the proposed works site area. › Construction works will be limited to daylight hours and artificial lighting to facilitate works will not be permitted, where works occur in proximity to watercourses. Otters, being crepuscular in nature, will therefore not be disturbed by construction works. › The best means practical, including proper maintenance of plant machinery, will be employed to reduce the noise produced by on-site operations. › All vehicles and mechanical plant machinery will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. › Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. › Machines which are used intermittently will be shut down or throttled back to a minimum during those periods when they are not in use. › Any plant machinery such as generators or pumps which are required to work outside of normal working hours will be surrounded by an acoustic enclosure.		
Construction					
MM2	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	6.2.2 in the AASR/NIS	Potential Effects from Clear Felling All felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, including the specific guidelines listed below, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment. › Forestry Standards Manual (Forest Service, 2015) › Environmental Requirements for Afforestation (Forest Service, 2016a)		

- Land Types for Afforestation (Forest Service, 2016b)
- Forest Protection Guidelines (Forest Service, 2002)
- Forest Operations and Water Protection Guidelines (Coillte, 2013)
- Forestry and Water Quality Guidelines (Forest Service, 2000b)
- Forestry and the Landscape Guidelines (Forest Service, 2000c)
- Forestry and Archaeology Guidelines (Forest Service, 2000d)
- Forest Biodiversity Guidelines (Forest Service, 2000e)
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018)
- Coillte Planting Guideline SOP
- A Guide to Forest Tree Species Selection and Silviculture in Ireland (Horgan et al., 2003)
- Management Guidelines for Ireland's Native Woodlands. Jointly published by the National Parks & Wildlife Service (Cross and Collins, 2017)
- Native Woodland Scheme Framework (Forest Service, 2018)
- Code of Best Forest Practice (Forest Service, 2000)

Mitigation by Avoidance:

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document *"Forestry and Water Quality Guidelines"* are shown in Table 6-1.

Table 6-1 Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m

Very steep	(>30%)	20 m	25 m

During the Proposed Wind Farm construction phase a self-imposed buffer zone of 50 metres will be maintained for the Foyle South Stream where possible.

Mitigation by Design:

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- Machine combinations (i.e., handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (approximately 0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and will avoid being placed at right angles to the contour;
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- All drainage channels will taper out before entering the 50m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone.

			On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone; › Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled; › Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall; › Timber will be stacked in dry areas, and outside a local 50 metre watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites; › Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off; › Checking and maintenance of roads and culverts will be on-going through the felling operation; › Refuelling or maintenance of machinery will not occur within 50m of a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; › A permit to refuel system will be adopted; › Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors; › Crossing of streams will not be permitted; › Trees will be cut manually from along streams and using machinery to extract whole tree; and, › Travel only perpendicular to and away from stream. <u>Silt Traps:</u>		

			Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner. <u>Drain Inspection and Maintenance:</u> The following items shall be carried out during pre-felling inspections and after: › Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines; › Inspection of all areas reported as having unusual ground conditions; › Inspection of main drainage ditches and outfalls. During pre-felling inspections the main drainage ditches shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall; › Following tree felling all main drains shall be inspected to ensure that they are functioning; › Extraction tracks near drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; › Culverts on drains exiting in the Site will be unblocked; and, › All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall. <u>Surface Water Quality Monitoring:</u> Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e., where an impact has been shown).		

			Criteria for the selection of water sampling points include the following: › Avoid man-made ditches and drains, or watercourses that do not have year-round flows, i.e. avoid ephemeral ditches, drains or watercourses; › Select sampling points upstream and downstream of the forestry activities; › It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry; › Where possible, downstream locations will be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and, › The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed. Also, daily surface water monitoring forms will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection. **Potential Effects from Earthworks Resulting in Suspended Solids Entrainment in surface Waters (Proposed Project)** The key mitigation measure during the construction phase of the Proposed Wind Farm is the avoidance of sensitive aquatic areas where possible. All of the key areas of the Proposed Wind Farm infrastructure are actually significantly away from the 50m delineated buffer zones with the exception of proposed new roads, 3 no. proposed crossings on the Foyle South Stream. Additional control measures, which are outlined further on in this section, will be undertaken at these locations within buffers.		

			The large setback distance from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures (discussed below) to be properly installed and operated effectively. The proposed buffer zone will: › Avoid physical damage to watercourses, and associated release of sediment; › Avoid excavations within close proximity to surface water courses; › Avoid the entry of suspended sediment from earthworks into watercourses; and, › Avoid the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone. Mitigation by Design: › Source controls: ○ Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems. ○ Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures. › In-Line controls: ○ Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems. › Treatment systems:		

			○ Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. It should be noted for the northern portion of the Proposed Wind Farm site is that an extensive network of forestry agricultural drains already exist, and these will be integrated and enhanced as required and used within the Proposed Project drainage system. The integration of the existing drainage network and the Proposed Project network is relatively simple. The key elements being the upgrading and improvements to water treatment elements, such as in line controls and treatment systems, including silt traps, stilling ponds and buffered outfalls. The main elements of interaction with existing drains will be as follows: › Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the Proposed Project drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion; › Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area; › Runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through stilling ponds and buffered outfalls onto vegetated surfaces; › Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site; and, › Drains running parallel to the existing roads requiring widening will be upgraded, widening will be targeted to the opposite side of the road. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works. Regular		

			buffered outfalls will also be added to these drains to protect downstream surface waters. Pre-commencement Temporary Drainage Works Prior to the commencement of new road/hardstand (or road upgrades) the following key temporary drainage measures will be installed: › All existing dry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using temporary check dams/silt traps; › Clean water diversion drains will be installed upgradient of the works areas; › Check dams/silt fence arrangements (silt traps) will be placed in all existing drains that have surface water flows and also along existing roadside drains; and, › A double silt fence perimeter will be placed down-slope of works areas that are located inside the 50m watercourse and 10m drain buffer zones such as at watercourse crossings. Water Treatment Train: A final line of defence will be provided by a water treatment train such as a “Siltbuster”. If the discharge water from construction areas fails to be of a high quality during regular inspections, then a filtration treatment system (such as a ‘Siltbuster’ or similar equivalent treatment train (sequence of water treatment processes) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply for all of the construction phase. Silt Fences: Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to water courses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these of these structures during construction phase is critical to their functioning to stated purpose.		

			They will remain in place throughout the entire construction phase. Double silt fences will be placed within drains down-gradient of all construction areas inside the 50m hydrological buffer zones. Silt Bags: Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the majority of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats Sediment entrapment mats, consisting of coir or jute matting, will be placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure. Settlement Ponds: The Proposed Wind Farm infrastructure footprint has been divided into drainage catchments (based on topography, outfall locations, and catchment size) and stormwater runoff rates based on the 10-year return period rainfall event were calculated for various catchment areas in order to size the settlement ponds. The 10-year return period rainfall event is a recommendation of the IFI relating to other recent wind farm projects (i.e. Cahermurphy Wind Farm, Co. Clare - Planning Ref P20/658). The location and dimensions of proposed settlement ponds are shown on the Proposed Wind Farm site drainage plan drawings (**Appendix 6**). Level Spreaders and Vegetation Filters: The purpose of level spreaders is to release treated drainage flow in a diffuse manner, and to prevent the concentration of flows at any one location thereby avoiding erosion. Level spreaders are not intended to be a primary treatment component for development surface		

			water runoff. They are not stand-alone but occur as part of a treatment train of systems that will reduce the velocity of runoff prior to be released at the level spreader. In the absence of level spreaders, the potential for ground erosion is significantly greater than not using them. Vegetation filters are essentially end-of-line polishing filters that are located at the end of the treatment train. In fact, vegetation filters are ultimately a positive consequence of not discharging directly into watercourses which is one of the mitigation components of the drainage philosophy. This makes use of the natural vegetation of the Site to provide a polishing filter for the Wind Farm drainage prior to reaching the downstream watercourses. Again, vegetation filters are not intended to be a single or primary treatment component for treatment of works area runoff. They are not sand-alone but are intended as part of a treatment train of water quality improvement/control systems (i.e. source controls®check dams®silt traps®settlement ponds®level spreaders ®silt fences®vegetation filters). Pre-emptive Site Drainage Management The works programme for the entire construction stage of the Proposed Project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast. The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities: › General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates; › MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;		

			• 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events; • Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and, • Consultancy Service: Met Eireann provides a 24-hour telephone consultancy service. The forecaster will provide an interpretation of weather data and give the best available forecast for the area of interest. Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event. Works will be suspended if forecasting suggests either of the following is likely to occur: • >10 mm/hr (i.e., high intensity local rainfall events); • >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or, • >half monthly average rainfall in any 7 days. • Prior to works being suspended the following control measures will be completed: • Secure all open excavations; • Provide temporary or emergency drainage to prevent back-up of surface runoff; and, • Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded. Management of Runoff from the Spoil Repository Area: It is proposed that excavated spoil will be used for landscaping where required. The excess material will then be placed in 1 no. Spoil Deposition Area (SDA). The SDA is located outside of 50m watercourse buffers and also outside of 30m karst feature buffers (enclosed depressions and sink holes).		

			During the initial construction of deposition area, silt fences, straw bales and biodegradable geogrids will be used to control surface water runoff from works areas. Where applicable, the vegetative top-soil layer of the soil and spoil management areas will be rolled back to facilitate placement of excavated spoil, following which the vegetative-top soils layer will be reinstated. Where reinstatement is not possible, spoil management areas will be sealed with a digger bucket and seeded as soon possible to reduce sediment entrainment in runoff. Drainage from spoil storage areas will ultimately be routed to an oversized swale and a number of stilling ponds with appropriate storage and settlement designed for a 1 in 10-year return period before being discharged to the on-site drains. Subsoil reinstatement areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised peat/subsoil reinstatement areas will no longer be a potential source of silt laden runoff. Timing of Site Construction Works: Construction of the site drainage system will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and operational for all subsequent construction works. Monitoring: An inspection and maintenance plan for the on-site construction drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed		

			drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling. Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. Checks will be carried out on a daily basis. During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse and specifically following heavy rainfall events (as per the CEMP included in **Appendix 5** of this report). **Potential Impacts on Groundwater Levels During Excavations (Proposed Project)** No potential for adverse effects on any European Site via Impacts on Groundwater Levels During Excavations No mitigation required. **Potential Impacts from Excavation Dewatering and Potential Impacts on Surface Water Quality (Proposed Project)** Proposed Mitigation Measures: Management of excavation inflows and subsequent treatment prior to discharge into the drainage network will be undertaken as follows: › Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place; › If required, pumping of excavation inflows will prevent build-up of water in the excavation;		

			• The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters; • The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a silt bags or silt buster; • There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur; • Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical assessment undertaken; • At the turbine locations adequately sized settlement ponds will be constructed to treat pumped water prior to discharge into a local manmade drain; • A mobile 'Siltbuster' or similar equivalent specialist treatment system can be made available at turbine locations for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed. **Potential Release of Hydrocarbons During Construction and Storage (Proposed Project)** Proposed Mitigation Measures: Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows: • On site re-fuelling of machinery will be carried out using a dedicated fuel truck. The fuel truck will also carry fuel absorbent material and pads in the event of any accidental spillages; • Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; • On-site refuelling will be carried out by trained personnel only; • A permit to fuel system will be put in place;		

			› Fuels stored on site will be minimised. Fuel storage areas if required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor; › The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, › An emergency plan for the construction phase to deal with accidental spillages will be included within the Construction and Environmental Management Plan (**Appendix 5**). Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area. **Potential Impacts from Groundwater and Surface Water Contamination from Wastewater Disposal (Proposed Project)** Proposed Mitigation Measures: › It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. It is not proposed to treat wastewater on-site. **Potential Impacts from Release of Cement-Based Products** Proposed Mitigation Measures: › No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place; › Where possible pre-cast elements for culverts and concrete works will be used; › Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds located outside of Clomantagh/Killoshulan Group Water Scheme ZoC;		

			› Weather forecasting will be used to plan dry days for pouring concrete; and, › The pour site will be kept free of standing water and plastic covers will be ready in case of a sudden rainfall event. **Potential Impacts from Morphological and Hydrological Effects due to New Watercourse Crossing Works (Proposed Wind Farm)** Proposed Mitigation Measures: › All proposed 3 no. new stream crossings will be bottomless or clear span structures and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the stream at the proposed crossing location; › Where the proposed cable route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road; › All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland1 is incorporated into the design of the proposed crossings; › As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI); › During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,		

[1] *Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*

			• All new 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. **Potential Hydrological Effects on Designated Sites (Proposed Project)** Drainage mitigation measures for surface water quality protection during the construction phase are summarised again below: (Please refer to Sections above for the full description of these measures and how they will be applied). • The proposed mitigation measures which will include 50m buffer zones for avoidance of sensitive hydrological features (streams and rivers); • 30m karst feature buffers; • Pre-construction drainage control measures; • Robust drainage control measures (i.e. interceptor drains, swales, settlement ponds and treatment trains such as Siltbuster) will ensure that the quality of runoff from Proposed Project areas will be very high; • Best practice measures with regard use of oils, fuels (discussed above) and cement-based compounds; and, • Mitigation relating to HDD works are presented in Section 6.4.2.1.13 below which will be applied during the River Nore crossing, **Potential effects from Turbine Delivery Route Works (Wind Farm)** No potential for adverse effects on any European Site as a result of accommodation works associated with the TDR. No mitigation required. **Potential Effects of Construction Works on the WFD Status of Downstream Waterbodies (Proposed Project)** Proposed Mitigation Measures:		

			Comprehensive surface water mitigation and drainage controls are outlined in Section 6.4.2.1.1 (Felling of Coniferous Plantations), Section 6.4.2.1.2 (Earthworks), Section 6.4.2.1.4 (Excavation Dewatering), Section 6.4.2.1.5 (Hydrocarbons), Section 6.4.2.1.6 (Cement-based Products) and Section 6.4.2.1.8 (Morphological Changes to Watercourses). These will ensure the protection of surface water quality and flows in all downstream receiving watercourses. **Potential Impacts from Use of Siltbuster and Impacts on Downstream Surface Water Quality (Proposed Project)** Mitigation Measures: Measures employed to prevent overdosing and potential chemical carryover: › The siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding reagents, as a result the risk of over dosing is minimised; › Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system; › Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment; › Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover; and, › Use of biodegradable chemical agents can be used at very sensitive sites (i.e. upstream of SACs). **Potential Impacts on Surface Water Quality Effects of the Proposed Grid Connection Earthworks and Watercourse Crossings (Grid Connection)** Proposed Mitigation Measures: Pre-commencement Temporary Drainage Works:		

			Prior to the commencement of substation, cable trenching or access road works the following key temporary drainage measures will be installed: › All existing roadside drains (where present) that intercept the proposed works area will be temporarily blocked down-gradient of the works using check dams/silt traps; › Culverts, manholes and other drainage inlets (where present) will also be temporarily blocked; and, › A double silt fence perimeter will be placed along the road verge on the down-slope side of works areas that are located inside a watercourse 50m buffer zone The following mitigation measures are proposed for the underground cabling watercourse crossing works: › No stock-piling of construction materials will take place along the grid route; › No refuelling of machinery or overnight parking of machinery is permitted in this area; › No concrete truck chute cleaning is permitted in this area; › Works will not take place at periods of high rainfall, and will be scaled back or suspended if heavy rain is forecast; › Local road drainage, culverts and manholes will be temporarily blocked during the works; › Machinery deliveries will be arranged using existing structures along the public road; › All machinery operations will take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur; › Any excess construction material will be immediately removed from the area and sent to a licenced waste facility; › No stockpiling of materials will be permitted in the constraint zones; › Spill kits will be available in each item of plant required to complete the stream crossing; and, › Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.		

			Fracture Blow-out (Frac-out) Prevention and Contingency Plan for HDD: › The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e. Clear Bore Drilling Fluid or similar will be used); › The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage; › One or more lines of silt fencing will be placed between the works area and the adjacent river; › Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility; › Adequately sized skips will be used where temporary storage of arisings are required; › The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse; › This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur, then drilling will be immediately stopped; › Any frac-out material will be contained and removed off-site; › The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and, › If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location. **Biodiversity Management and Enhancement Plan (BMEP)** No potential for adverse effects on any European Site as a result of the proposed enhancement works. No mitigation required.		
Operation					

MM3	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	6.2.2.3 in the AASR/NIS	**Progressive Replacement of Natural Surface with Lower Permeability Surface** Proposed Mitigation by Design: The proposed drainage philosophy outlined in **Appendix 6** states that runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies. Two distinct methods will be employed to manage drainage water within the Proposed Project. The first being 'keeping clean water clean' and the second involving the collection of any drainage waters from work area and to route them towards stilling ponds prior to controlled diffuse release over vegetated surfaces. The second method relates to proposed design measures that will prevent road surface and other hardstand areas acting as preferential flowpaths. All development site runoff will be collected, attenuated, treated and then released in a diffuse and regular manner that does not significantly change the natural drainage regime/hydrology of the site. The operational phase drainage system of the Proposed Project will be installed and constructed in conjunction with the road and hardstanding construction work as described below and as shown on the drainage drawings (**Appendix 6**): › Interceptor drains will be maintained up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it will be re-distributed over the ground by means of a level spreader; › Swales/road side drains will be used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling; › On steep sections of access road transverse drains ('grips') will be constructed in the surface layer of the road to divert any runoff off the road into swales/road side drains; › Check dams will be used along sections of access road drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock; › Settlement ponds, emplaced downstream of road swale sections and at turbine locations, will buffer volumes of runoff discharging from the drainage system during		

			periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and, › Settlement ponds will be designed in consideration of the greenfield runoff rate. These measures will ensure all surface water runoff from upgraded roads and new road surfaces (including hardstands and turbine base areas) will be captured and treated prior to discharge/release. Settlement ponds, check dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment. **Runoff Resulting in Suspended Solids Entrainment in Surface Waters** Proposed Mitigation Measures: The mitigation measures outlined in Sections 6.4.2.1.2 & 6.4.2.1.2 will ensure all surface water runoff from upgraded roads and new road surfaces (including hardstand and turbine base areas) will be captured and treated prior to discharge/release. Settlement ponds, checks dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment. It is proposed that bedrock from off-site sources will be used to construct the sub-base layer of proposed upgraded and new access roads, hardstand areas and turbine base areas. Once installed the subbase layer will be overlain by a clean capping layer of high-grade stone material which will be sourced from local quarries also.		
Decommissioning					
MM4	Potential for Indirect Effects on European Sites – Deterioration of Water Quality	6.2.2.5 in the AASR/NIS	The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.		

			The same mitigation to prevent significant impacts on water quality during construction will be applicable to the decommissioning phase.		

1.2 NIS Monitoring Measures

Table 1-2 Schedule of Monitoring

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
			Pre-Construction Phase			
MX1	Drainage Maintenance	Section 6.2.2.1.1	The following items shall be carried out during pre-felling inspections and after: › Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines; › Inspection of all areas reported as having unusual ground conditions; › Inspection of main drainage ditches and outfalls. During pre-felling inspections the main drainage ditches shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall; › Following tree felling all main drains shall be inspected to ensure that they are functioning; › Extraction tracks near drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; › Culverts on drains exiting in the Site will be unblocked; and, All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.	On going	Monthly	Project Hydrologist

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
	Surface Water Quality Monitoring	Section 6.2.2.11	Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e., where an impact has been shown). Criteria for the selection of water sampling points include the following: › Avoid man-made ditches and drains, or watercourses that do not have year-round flows, i.e. avoid ephemeral ditches, drains or watercourses; › Select sampling points upstream and downstream of the forestry activities; › It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry; › Where possible, downstream locations will be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and, › The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed.	On going	Monthly	Project Hydrologist

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
			Also, daily surface water monitoring forms will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.			
Construction Phase						
MX2	Excavation Dewatering	Section 6.2.2.1.4	Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical assessment undertaken	As required	As Necessary	ECoW
MX3	Fracture Blow-out (Frac-out)	Section 6.2.2.1.13	› The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e. Clear Bore Drilling Fluid or similar will be used); › The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage; › One or more lines of silt fencing will be placed between the works area and the adjacent river; › Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility; › Adequately sized skips will be used where temporary storage of arisings are required; › The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse; › This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur, then drilling will be immediately stopped;	Daily	As Necessary	ECoW / Project Hydrologist

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
MX4	Earthworks Resulting in Suspended Solids	Section 6.2.2.1.2	An inspection and maintenance plan for the on-site construction drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling. Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. Checks will be carried out on a daily basis. During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse and specifically following heavy rainfall events (as per the CEMP included in **Appendix 5** of this report).	As Required	Monthly	ECoW / Project Hydrologist
MX5	Use of Siltbuster	Section 6.2.2.1.12	› The siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding reagents, as a result the risk of over dosing is minimised; › Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system; › Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment;	As Required	Monthly	ECoW / Project Hydrologist

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
			› Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover; and, › Use of biodegradable chemical agents can be used at very sensitive sites (i.e. upstream of SACs).			
Operational Phase						
MX6	Drainage Inspections	6.2.2.1.1	› The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored.	Monthly	Monthly	ECoW / Project Hydrologist
MX7	Post Construction Monitoring	Appendix 3 Chapter 9 of the EIAR	› Monthly sampling for laboratory analysis for the range of parameters adopted during pre-commencement and construction phases will continue quarterly after construction is complete. The Project Hydrologist will monitor and advise on the readings received from the testing laboratory and monitoring will only cease once the hydrologist is satisfied that the chemical and biological monitoring results show that there is no adverse impact on the quality of surface water within the natural watercourses draining the Site.	Quarterly	As required	ECoW / Project Hydrologist
Decommissioning Phase						
MX8	Decommissioning	Appendix 3	› The EnvCoW will maintain responsibility for monitoring the decommissioning works and Contractors/Sub-contractors from an environmental perspective. The EnvCoW will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with OCC and other statutory bodies as required.	End of Operational Life	As Required	Site Manager/ EnvCoW

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
MX9	Decommissioning	Appendix 3	› The Site Manager in consultation with the EnvCoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.	End of Operational Life	As Required	Site Manager/ EnvCoW